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The purpose of this research is to articulate the relationships that exist between housing affordability by metropolitan areas and the following variables: housing costs, income, educational attainment, population density, population growth rate, and employment composition by economic sector (professional, sales and office, and service). This paper will contribute to the existing affordability literature by considering all of these variables simultaneously through a regression equation based on US Census data.

The findings indicate that housing affordability is geographically differentiated with the West Coast metropolitan areas being the least affordable and the South Central metropolitan areas being most affordable. Some of the predictors of housing affordability appeared to be educational attainment, employment mix, and population density based on correlation and regression results.

HOUSING AFFORDABILITY BY METROPOLITAN AREA

by
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This thesis is dedicated to my husband Sam Wolff and my son Emmett Wolff. Their support through the long process made this work possible.

I am forever grateful for their sacrifice and their belief in me.

For Sam and Emmett with all my love.

This thesis was in part inspired by the Orange Community Housing and Land Trust (OCHLT) (Orange County, North Carolina), and their efforts toward “keeping homeownership affordable for generations to come.” Executive Director, Robert Dowling, spearheads this effort with superior vision and leadership.

APPROVAL PAGE

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CHAPTER I

INTRODUCTION

It is well publicized that housing costs have been rising faster than incomes across the United States in many metropolitan areas. Downs (2005, p. 20) documented that “22.3 million American households (21.1 percent of all American households and 53.6 percent of all those with incomes below 80 percent of the national median) had a housing affordability problem in 1999...” Since 1999, the median sales price of a single family home rose 43.2 percent in just five years from \$133,300 to \$191, 000 (in current dollars) (Downs 2005). Across the United States, median household incomes rose only slightly in the same five-year period (Downs 2005).

The cost of housing is not uniform across the United States and certain metropolitan areas show a larger increase in home prices than others. According to the Office of Federal Housing Enterprise Oversight (OFHEO), home prices across the nation have increased about 50 percent in the past five years. Housing markets in Florida, California, Nevada, and Arizona show the highest rates of house price appreciation over the past year averaging an increase of 30 percent (Russel and Mullin 2005). Fiserv CSW, a leading home price research company, analyzed housing market data from the five-year period from 1999 to 2004 and found that “home prices in the Miami-Fort Lauderdale metro have doubled over the last five years, and [are] forecasting that they

will appreciate another 16.4 percent this year” and that “over the past five years home prices in the Los Angeles area appreciated 125 percent, with prices in a handful of zip codes up nearly 200 percent” (Max 2005, p. 1).

Data from the U.S. Bureau of Labor Statistics (2006) shows Metropolitan Areas (MAs) in states that rank highest for percentage increases in job growth (Arizona, Nevada, and Florida from 1995-1996 and Arizona, California, and Nevada from 2004-2005) have similar rankings as the highest ranked MAs for increases in home prices (Arizona Department of Economic Security 2006). A Brookings Institution report also shows similarities in the growth rate rankings of “high human capital”¹ cities and cities with strong service industries suggesting a negative correlation exists between the percentage of civilians employed in manufacturing (in 1990) and the growth rate between 1990 and 2000 (Glaeser and Shapiro 2001). Areas with high growth rates tend to be leading contributors to job growth in the “new economy”. That is, those areas where the employment sector consists largely of highly educated and skilled white-collar workers in service-oriented employment and where manufacturing industries make up a smaller portion of employment in the region.

Glaeser and Shapiro (2001) also find that cities with a higher median household income grew at a much faster rate than cities with lower household median incomes. They show that areas whose household median income is greater than \$30,000 had an approximate growth rate of 18 percent between 1990 and 2000 while areas whose household median income is less than \$20,000 had a less than one percent increase.

¹ “High human capital” cities refers to cities whose population is highly skilled with a substantial percentage of the workforce with a college degree.

Existing literature infers that housing affordability ² problems in select metropolitan areas are a function of home prices, household incomes, population growth rates, population densities, education level, and employment composition. However, all of these variables have not previously been studied simultaneously. It is important to study all of these variables together in order to find out which variables have the most influence on housing affordability by metropolitan area. The answer to this question could provide a sound basis for policy initiatives in the future. To this end, further analysis of these factors could provide the answer regarding what relationships might exist between housing affordability and population growth rates, population densities, employment sector, education level and household median income. The aim of this research is to describe potential factors that most significantly contribute to the geographic variation of housing affordability rates by metropolitan areas. It is hypothesized that housing affordability problems in select metropolitan areas are a result of the dynamic interaction that exists between both home prices and household incomes, while additional important explanatory variables include the educational attainment of metropolitan workers, overall population densities, and relative location as measured by Census Division.

² Housing affordability for the purposes of this research refers to the “ease” with which the cost of housing can be absorbed by household income.

CHAPTER II

REVIEW OF THE LITERATURE

Recent literature on housing affordability claims that the cost of housing is an increasing problem across the United States. Additionally, trends in the literature suggest that examining housing affordability at a regional level is of increasing importance. Belsky and Lambert (2001) conducted a comprehensive metropolitan-wide study of housing and found that metropolitan housing markets have experienced significant growth during the 1990s. “Between 1990 and 2000, eleven of the nation’s metropolitan areas added 250,000 or more homes and 23 metropolitan areas saw their housing stock expand by 25 percent or more” (Belsky and Lambert 2001, p. 2). However, affordable housing in many of these markets is in short supply, in part due to localized and restrictive regulations such as zoning, permit caps, development fees and decreased levels of governmental subsidies. Belsky and Lambert (2001) argued that affordable housing issues must be addressed in a metropolitan context and that the balance of housing start-ups to match employment locations must be addressed at a regional scale. They found that between 1990 and 1998 higher job growth rates are located on the periphery of many metropolitan areas in lower density counties, while the poor are concentrated in the central cities of these same metropolitan markets.

A metropolitan approach to examining housing affordability is paramount due to dramatic regional growth rates in recent history. Ehrlich and Gyourko (2000) show that the scale and size distribution of US metropolitan areas from 1910 to 1995 have changed in pattern. Prior to WWII, the country's population was becoming increasingly concentrated in a few large cities where there was also a dominance of manufacturing activities. The number of metropolitan areas has doubled since 1950 and the dispersion of this metropolitan growth was not absorbed evenly by all areas, but was concentrated in the second tier markets (Ehrlich and Gyourko 2000).

Squires and Kubrin (2005) describe recent patterns of metropolitan development across the US and present information showing the decrease in densities across metropolitan areas where population density declined from 407 to 330 persons per square mile. Overall, metropolitan area population increased from 55.1 per cent to 62.2 percent at the national level. In the 1990s suburban population grew 17.7 percent. Metropolitan areas grew from a total land area of 208,000 square miles that housed 84 million people in 1950 to 585,000 square miles housing 193 million people by 1990 (Squires and Kubrin 2005). The growth of metropolitan areas with uneven development and inequities between the isolated poor in central cities and the wealthier suburbs exacerbates the uneven development problem.

The dramatic increase in the physical and population size of the nation's metropolitan areas provide sufficient evidence of their importance. This is of particular interest to this thesis because both housing and employment opportunities are studied within a metropolitan context. Additionally, housing affordability at the metropolitan

level is this thesis' main focus. Studies show that the increase in the lack of housing affordability impacts the population for those seeking both owner-occupied and tenured housing and that the problem has increased since patterns of suburbanization began to proliferate (Gyourko and Linneman 1993; Gyourko 1998; Case and Mayer 1996; Moore and Skaburskis 2004).

1. Cost of Housing

Gyourko and Linneman (1993) identified several key components of the affordability problem which include the increased cost of housing and real wage decline from 1960 to 1989. The increased cost of housing is attributed to the proliferation of more stringent building codes, approval delays, low-density zoning, and impact fees. Over this 30-year period, the least expensive homes have increased 6.4 percent per year and the most expensive homes have increased 5.1 percent per year with an overall median of 2.3 percent per year (Gyourko and Linneman 1993).

According to Gyourko and Linneman (2003), real wages have declined since the mid 1970s, especially for lower- and middle-class homeowners. This decline has made it difficult to achieve homeownership. Most home seekers in these classes are low-skilled workers and their wages have eroded due to an increasingly competitive global economy, particularly since the mid 1970s. For example, between 1960 and 1974, the mean family income rose 29.1 percent but it only rose 3.3 percent from 1974 to 1989 (Gyourko and Linneman 1993). After 1974 “workers with less than a high school education experienced a 21.7 percent real wage loss” and workers with a high school degree

showed a 14.7 percent decrease in real wages (Gyourko and Linneman 1993, p.67). The education level of homeowners over this period shows that homeownership is increasingly associated with higher levels of educational attainment because of the potential to obtain a higher income (Gyourko and Linneman 1993).

Building on this 30-year study, Gyourko (1998) extends his findings to claim that affordability is more of a problem for households whose head of household is under the age of 36 because there is a decline in ownership rates for this demographic. He finds an increase in the number of female-headed households and that the number of married household heads has decreased. Gyourko (1998) further analyzes education levels and finds that the least well-educated class own at lower rates than in the past, particularly for younger age groups.

In a study across Canadian metropolitan areas, Moore and Skaburskis (2004) found that households with severe affordability problems have tripled from 4.5 percent to 13.6 percent from 1982-1999. These severe affordability problems are felt by all household types in all parts of the country but are more prevalent in the largest cities, especially those with higher growth rates. Moore and Skaburskis (2004) linked the problem to changes in employment patterns and increased government regulations within the housing market. In particular, single males and females and lone parents were most at risk. In Canada, as in the United States, the affordability crisis is attributed to the lack of an adequate supply of affordable housing and changes in income due to economic restructuring (Moore and Skaburskis 2004).

Housing affordability problems are increasingly associated with patterns of employment which have showed significant change during the era of suburbanization. Case and Mayer (1996) studied the Boston metropolitan area from 1982 to 1994 and found that house prices are related to differences in employment patterns (particularly in the manufacturing sector), accessibility to employment nodes, and the quality of schools in the local jurisdiction. The study analyzed 168 Massachusetts towns in the Boston metropolitan area and the results showed that towns with the greatest appreciation rates were closer to Boston. Also, home prices close to manufacturing employment opportunities fell because demand for these homes declined. The authors found that homebuyers viewed location and accessibility to employment as an amenity. Since manufacturing employment opportunities were declining, demand declined. Additionally, when there is a reduction in manufacturing employment, Case and Mayer (1996) relate the fall of home prices with the percentage of local residents employed in the service sector.

Much of the increasing housing affordability problem is attributed to increased government regulations including zoning, building codes, impact fees, permit caps, and other growth controls (Gyourko and Linneman 1993; Schill and Wachter 1995; Gyourko 1998; Lawhon 2004). Between 1960 and 1989, Gyourko and Linneman (1993; Gyourko 1998) show that the quality of homes has increased such that homes are not produced at a low enough quality for a growing number of the population to afford.

While their study focuses on racial segregation, Schill and Wachter (1995) found that non-market forces (federal and local regulations) contributed to significant

geographic differentiation within a housing market and they found that differences in local regulations can cause differences in house prices often times excluding low- and medium-income households.

Malpezzi (1996) examined supply side constraints such as average commute time, racial segregation, and neighborhood quality as functions of income, house prices, demographics, and regulation. Regulation was measured by rent controls, land use and zoning regulations, infrastructure policies, and building and subdivision codes. The results showed that regulation can raise house prices (rents and house value), and thus reduce homeownership rates; and substantial regulation can decrease homeownership by up to 10 percent. Such findings are important because many high growth communities have implemented impact fees to offset their costs for providing the required infrastructure and expected level and provision of amenities.

Lawhon (2004) describes the effects of development impact fees and growth by analyzing the price of housing in Loveland, Colorado and Fort Collins, Colorado between 1983 and 1986. The study found that high growth communities that implement impact fees can exacerbate the housing affordability problem. In addition to worsening the affordability problem, impact fees can cause the poor to pay a greater proportion of their income on housing (Lawhon 2004).

The literature reviewed above mostly finds that housing affordability is explained by a function of supply and demand where factors for each side are examined. However the following two studies solely analyzed the physical costs of housing without utilizing demographic variables. Glaeser and Gyourko (2002) argue that the price of housing is

close to the marginal, physical costs of new construction and that housing prices are significantly higher than construction costs in only a limited number of areas, such as California and some eastern cities. Glaeser and Gyourko (2002) argued that excessive zoning³ and land use controls are the primary factors explaining the higher housing costs. They define a housing affordability problem as existing when housing is expensive relative to its fundamental costs of production.

Glaeser and Gyourko (2002) focus on the gap between the cost of housing and the cost of construction. The results showed there are three broad housing markets by region: 1) housing priced far below the cost of new construction (these areas are found in central cities in the Northeast and Midwest, or areas that are not experiencing growth); 2) housing priced close to construction costs (mostly in areas of robust growth or sprawl where land is cheap – this is most of the US); and 3) homes that price higher than the cost of construction (New York City, California, Northeast and South). Glaeser and Gyourko (2002) argued that high cost places generally have good amenities or strong labor markets. Overall, this study shows that expensive housing markets can be due to stringent government regulation and highly skilled labor markets that offer robust salaries.

Glaeser and Gyourko (2005) published a report illustrating that construction costs can directly impact population growth rates by US city. Population growth rates were found to be lower in cities with a greater proportion of their housing stock valued below

³ Excessive zoning refers to zoning codes that place multiple limitations on a property when being developed or re-developed. This can include, but is not limited to zoning codes that require landscaped buffers, street trees, and sidewalks; or limit the development or placement of accessory buildings, parking, or signage.

the cost of new construction. This connection was not causal in nature but suggests that the housing market plays a role in urban growth. Glaeser and Gyourko (2005) used a data sample that included cities with at least 30,000 residents in 1970. These cities, over time, experienced a decline in population when the construction cost of housing is at or below the price of a home. For example, the study showed that older rust belt cities tended to have two thirds or more of the housing stock priced at or below construction value and that for 60 percent of the homes in the Northeast and Midwest, population declined one percent for every two percent decline in house price (Glaeser and Gyourko 2005). These results show that homes can be built quickly but disappear slowly; placing a greater importance on the existing housing stock of a city and the opportunity to develop human capital in a shifting economy.

By contrast, in expensive housing markets where only 10 percent of the housing stock is priced below the cost of construction in many cities such as Los Angeles, San Diego, and Honolulu, (Glaeser and Gyourko 2005) concluded that cities with a growing population do so at a faster rate than cities in decline. For example, the fastest growing city in the 1990s was Las Vegas; where population grew by 61.6 percent. The fastest declining city among cities with a population of at least 100,000 was Hartford, CT, which showed a loss of 13.9 percent (Glaeser and Gyourko 2005). Overall, the authors concluded that high house prices are associated with markets that have a higher income level.

According to the literature, housing affordability is also affected by the growth rate of an entire region. Miller and Peng (2004) analyzed housing price volatility across

277 Metropolitan Statistical Areas (MSAs) and claimed that price volatility can increase home appreciation rates, reduce personal income growth rates and impact the population growth rate in complex ways. For example, in an MSA with unconstrained supplies, the population growth can affect volatility. However, in an MSA with a constrained housing supply, volatility can reduce population growth rates (Miller and Peng 2004).

Housing affordability is of particular interest in high growth regions because growth influences supply and demand. Strassman (2000) examined data from 25 of the largest cities in the US and found that different processes can infringe upon urban housing markets. Internationally, a high mobility rate indicates a high degree of housing welfare (or greater affordability). Differences among mobility rates arise due to the unexpected changes such as the growth rate of employment.

Strassman's (2000) study examined the influence of variables such as building codes, zoning, and the level of taxes that vary from one locality to another. The results showed that these government interventions affect mobility and tend to increase the price of owner-occupied housing. In this study, population growth was found to be more of a determinant of mobility than market interventions; and that mobility was not necessarily associated with household income growth. "Higher population growth reinforces greater prosperity and rising incomes, hence the demand for larger and better dwellings." (Strassman 2000, p. 124). Additionally, Strassman (2000, p. 125) argued that "What matters most are the economic fortunes of particular industries that spur the growth of some cities and hold back others." Myers and Park (2002) claim that the issue of housing

affordability in California has been worsened by a lack of new housing construction such that housing markets have been unable to keep up with rapid population growth rates.

Growth control and growth management planning policies have been enacted to address some of the problems that stem from rapid suburban growth. However, poorly thought out growth controls in politically fragmented metropolitan areas can create spatial shifts in homebuilding by moving construction to nearby well-regulated localities (referred to as spillover effects) that can exacerbate housing affordability problems throughout the region. Growth management tools include population growth or housing permit caps, urban growth boundaries, adequate public facility ordinances, and implementing various restrictive residential zones (such as large lot, low density zones).

Byun, Waldorf, and Esparza (2005) examined growth controls and their effect on home building in two metropolitan areas in California (i.e., Los Angeles and San Francisco). Growth controls in these areas tended to generate spillover effects and impact surrounding jurisdictions. In California, generators of spillovers (i.e. local jurisdictions that implement growth control measures) are mostly located in the urban areas along the coast and the receiving communities are on the fringes of the metropolitan wide area. In the Los Angeles and San Francisco metropolitan areas, excess home building in peripherally located communities is linked to growth controls implemented in nearby jurisdictions. Of the 393 local jurisdictions that were studied, 152 (39 percent) did not have any growth controls implemented, 241 (61 percent) had at least one growth control measure and nearly 30 percent of these local jurisdictions had two or more growth control measure implemented (Byun et al. 2005). Byun et al. (2005) claim that the

spillovers were a result of the lack of regional planning where growth management increased home building costs and therefore house prices. This study of growth controls in California emphasizes the importance of studying home prices at a regional scale.

Housing problems are also exacerbated in the Atlanta region because of its rapid population growth. A comprehensive study by the Atlanta Neighborhood Development Partnership (ANDP 2005) highlights the need for a metropolitan approach. The Atlanta metropolitan area has grown from five to 28 counties in the past few decades. Between 1992 and 2002 Atlanta also added 1.2 million people and 626,000 jobs. Issues cited by the study include the jobs-housing mismatch. In Atlanta, housing and transportation costs combined account for two thirds of household income. Nationally, 14.3 million households spent more than 50 percent of their income on housing while 17.3 percent spent between 30 and 50 percent in 2003 (ANDP 2005). In the Atlanta region, moderately priced housing close to emerging employment markets are limited by stringent zoning restrictions that further hinder affordable housing opportunities. These restrictions can limit densities, prohibit multi-family developments, and require higher levels of buffering and landscaping; all of which increase costs. The ANDP (2005) suggests that government must encourage the private sector to provide affordable housing through incentives, funding, land donations, and technical assistance. They also suggest that any regional approach to affordable housing should include a regional housing resource center, regional housing coalitions, regional fair-share plans, inclusionary zoning, and the establishment of housing trust funds.

Two more studies provide evidence that housing affordability is linked to the jobs-housing imbalance that proliferates across America's metropolitan areas (Ihlanfeldt 1994; Levine 1998). Levine (1998) examined the spatial distribution of affordable housing near employment centers for low and medium-income workers. He found that there is a need for greater efforts by local jurisdictions to rezone for more affordable housing units closer to existing employment centers. Levine's model assumes that there is a shortage of affordable housing in close proximity to major suburban employment centers and that people who work at these sites are willing to use nearby housing if it were available within their price range even if it were smaller and denser. Throughout his study, he found that homebuyers are finding only limited supplies of affordable and acceptable housing near their workplaces and that they are willing to accept a longer commute to buy a house that is affordable.

Ihlanfeldt (1994) argued that job decentralization has not been uniform across occupational categories. "Entry-level jobs and those with low educational requirements have been declining within inner cities, while information-processing jobs generally requiring postsecondary schooling have been expanding" (Ihlanfeldt 1994, p.220). This phenomenon is compounded by the fact that many suburban employers are experiencing shortages of low-skilled workers because of the accessibility problem experienced by the inner city workforce and their inadequate transportation network. Consequently, there is a surplus of low skilled workers in the city in addition to a shortage in the suburbs (Ihlanfeldt 1994).

2. Regionalism

It has already been established that employment changes affect affordability (Gyourko and Linneman 1993; Case and Mayer 1996; Gyourko 1998). It is from within a metropolitan region that employers compete for workers and where workers find housing; and consequently, a regional perspective is crucial. Metropolitan areas are comprised of many localities that regulate housing and these markets are spatially defined by income as well as their demand for amenities.

A regional policy focus could be the appropriate unit to battle social and economic ills. Katz and Rogers (2001) identify declining central cities in the midst of growing metropolitan areas and find that polarized income capacities and access to employment are the result of fragmented land use planning and the creation of employment opportunities that favor the highly skilled. Regional policies are important because it is the regional labor market that fuels the economy. It is maintained that proper land use planning and growth management could improve metro area quality and shared prosperity. However, a policy goal should be to provide affordable housing throughout a region in order to reduce the spatial mismatch of jurisdictions (Katz and Rogers 2001).

Not all metropolitan regions are the same. Case and Mayer (1996) found that the structure of metropolitan housing markets can be a result of certain unique contexts. For example, Houston's variations in home markets were due to quick reductions in entrepreneurial and professional income which may be attributed to an increase of immigrants and low-end demand for housing (Case and Mayer 1996). California is

unique because it has an influx of immigrants (low-end demand for housing) as well as increases in entrepreneurial and professional income (high-end demand). In other metropolitan areas such as Boston, shifts in employment patterns within the region can cause one town to become less desirable than another. For example, when an employment node loses jobs, employment is sought in other towns that tend to be less accessible. Thus, transportation costs are increased to reach these new employment markets (Case and Mayer 1996). Housing and transportation costs, in this context, combine to impact affordability although the cost of transportation may not be as apparent.

A metropolitan perspective can capture isolated variations in housing affordability. Schill and Wachter (1995) show that extremely concentrated pockets of poverty have increased between 1980 and 1990 and are caused by both market and non-market forces within a metropolitan area. They suggest regulations such as zoning, impact fees, and growth controls exclude the poor by raising the cost of housing in local jurisdictions and cause the poor to search for housing elsewhere within a region. Schill and Wachter (1995) show that spatial stratification is a result of public choice through exclusion by taxation (for amenities) and the Not In My Backyard (NIMBY) phenomenon.

Fragmented regions can create spillover effects across local jurisdictions when certain localities use restrictive land use constraints and exclusionary zoning (Cho and Linneman 1993; Meyers and Park 2002). Cho and Linneman (1993) analyzed Fairfax County, Virginia to illustrate that a community with a significant amount of residentially

zoned land relative to adjacent areas can generate positive spillover effects (higher priced homes) but if the area is zoned for large lot (low density) residential then there is a negative spillover effect from adjacent communities. Local jurisdictions attempt to protect themselves from negative spillovers by implementing restrictive land use constraints which only exacerbates the housing affordability problem within a metropolitan context.

Basolo and Hastings (2003) cite the need to study housing in a regional context for the same reasons as Schill and Wachter (1995); central cities tend to have median incomes that are lower than that of the median for the region, higher poverty rates, and their housing values are lower compared to that of the entire region. In a case study of four regions (Portland, Oregon, Minneapolis-St. Paul, Minnesota, Louisville, Kentucky, and New Orleans, Louisiana), Basolo and Hastings (2003) analyzed public regional housing policies and found that only two of the regions studied attempted a regional housing policy. When a regional housing policy was created, it either had no enforcement mechanism or was not enforced. Schill and Wachter blame the failure of regional approaches to housing on inter city competition and NIMBY attitudes.

While most studies argue that the central cities of large metropolitan areas have the greatest need for effective affordable housing policies, Bunting and Walks, et al. (2004) argue instead that there is an even greater need to address affordability problems in the suburbs. They argue that while there are greater percentages of the population that are poor living in central cities, there is a greater number of households suffering from affordability problems in the suburbs and this has been overlooked because these

households are widely scattered across the suburbs. Bunting and Walks, et al. (2004) studied the nine largest urban centers in Canada and focused on renters experiencing affordability problems. Out of the four sub components of a metropolitan area (inner city, inner suburbs, outer suburbs and exurbs), it was found that the inner suburbs showed higher numbers of tenants with affordability problems.

There is consensus among housing advocates that housing must be more effectively addressed in the policy realm. Dreier (2000, p. 66) argued that housing problems are so acute that housing should be put back on the nation's political agenda and suggests that an attempt be initiated to develop a progressive housing agenda:

A progressive Federal housing policy should accomplish three things: First, it should help house the poor and working class and provide them with housing choices besides living in high-poverty areas or distressed neighborhoods. Economic globalization has transformed the U.S. economy and produced growing economic inequality and deepening poverty. Some form of government support is necessary to make housing economically manageable for the poor as well as for growing segments of the working class. Second, it should stimulate homebuilding and homebuying, particularly for the middle class. In doing so, it should direct government help to those who could not otherwise achieve the American Dream. The well-known multiplier effects of homebuilding will help stimulate jobs and economic growth. Third, housing policy should help rebuild the social and economic fabric of troubled neighborhoods overwhelmed by unemployment, concentrated poverty, crime, drugs, abandoned buildings, and hopelessness (Drier 2000, p.66).

For some policy analysts, part of any national housing agenda should include a growth management approach at the regional scale. A recent joint symposium on growth management and affordable housing sponsored by the Department of Housing and Urban

Development, The Fannie Mae Foundation, the National Association of Realtors, and The Brookings Institution (Downs 2004) articulated three themes in this regard: 1) even though growth management can constrain the supply in land, it is theoretically possible for it not to aggravate affordability problems, 2) a lack of political will and NIMBYism reduces the likelihood of implementing any pro-affordability provisions of growth management policies, 3) cooperation between advocates for growth management and affordable housing is imperative to ensure that growth management programs do not thwart the production of affordable housing (Downs 2004).

Downs (2004) asserts that no one program or policy will be able to address all the issues surrounding metropolitan growth and housing affordability. However, the reader is left feeling hopeful that properly planned and executed growth management can create a better quality of life for residents, and it can be done without exacerbating affordability problems. Specifically, "a desirable outcome will occur only if the growth management programs involved contain provisions specifically designed to create affordable housing by offsetting those aspects of growth management that inherently limit the land available for development and if there is a strong political will in the communities concerned to actually implement those pro-affordability provisions." (Downs 2004, p. 19).

Such issues are crucial because Driess and Atlas (1999, p.6) have indicated that "A census bureau study found that 48 % of American families could not afford to buy the median-price house in the region where they lived." Worse still, incomes for American workers including white collar and professional employees have declined – real wages fell 1.8 percent from 1973 to 1978 and fell 9.6 percent from 1979 to 1993 (Driess and

Atlas 1995). Along with this, home-ownership rates declined in the 1980s, from 65.6 percent in 1980 to 63.9 percent in 1989.

3. The New Economy

The so-called “new economy” may be directly affecting housing costs because it has been shown that high skilled labor markets tend to be those same metropolitan areas faced with acute housing affordability problems. According to Atkinson and Gottlieb (2001, p. 3) the New Economy “ is a global knowledge and idea-based economy where the keys to wealth and job creation are the extent to which ideas, innovation, and technology are embedded in all sectors of the economy – services, manufacturing, and agriculture.” Atkinson and Gottlieb (2001), briefly describe the emergence of the new economy and how they rank metropolitan areas in a Metropolitan New Economy Index report. They characterize the new economy as dispersed development in less dense areas of a metropolitan area. For example, most high technology jobs are located in the suburbs and in the 1990s, 57 percent of all offices were located in the suburbs (Atkinson and Gottlieb 2001). Unfortunately this trend increases the spatial mismatch problem between the underemployed and unemployed low skill population typically located in central cities and the available low-wage retail jobs in the periphery.

Furthermore, the majority of “new economy” jobs are located in suburban office parks as opposed to older central cities (Atkinson and Gottlieb 2001), while manufacturing employment now accounts for only 14 percent of total employment. Many of the New Economy jobs are managerial, professional, and technical positions that

require at least two years of college and these types of positions have increased their total share of employment. Although prevalent across the nation, new economy activities are more concentrated in large and mid-sized metropolitan areas.

“The Metropolitan New Economy Index” published by the Progressive Policy Institute (Atkinson and Gottlieb 2001) uses 16 economic indicators to assess the 50 largest metropolitan areas. Approximately 60 percent of the nation’s workforce is accounted for by these largest 50 metropolitan areas. The report highlights the differences among metropolitan economies and focuses attention on a policy framework that aims at promoting fast and widely shared income growth. The metropolitan areas were assessed by 16 indicators in five broad categories (Table 1) and listed the top 50 metropolitan areas (Table 2).

Table 1: Indicators of New Economy	
Broad category	Indicator
Knowledge jobs	Managerial/professional jobs
	Workforce education
Globalization	Export focus on manufacturing
Economic dynamism and competition	Gazelles (sales growth of $\geq 20\%$ for 4 years)
	Job churning (business starts vs. failures)
	New publicly traded companies
Transformation to a digital economy	Online population
	Broadband telecom
	Computer use in schools
	Commercial internet domains
	Internet backbone
Technological innovation capacity	High-tech jobs
	Degrees granted in science and engineering
	Patents
	Academic R&D funding
	Venture capital

Source: Atkinson and Gottlieb, 2001

Table 2: New Economy Ranking, 1999			
RANK	Metropolitan Area	RANK	Metropolitan Area
1	San Francisco	26	Richmond
2	Austin	27	St. Louis
3	Seattle	28	Detroit
4	Raleigh-Durham	29	Indianapolis
5	San Diego	30	Charlotte
6	Washington	31	Buffalo
7	Denver	32	Nashville
8	Boston	33	Cleveland
9	Salt Lake City	34	Cincinnati
10	Minneapolis	35	Las Vegas
11	Atlanta	36	Columbus
12	Dallas	37	Pittsburgh
13	Miami	38	New Orleans
14	Houston	39	Oklahoma City
15	Portland	40	Milwaukee
16	Phoenix	41	West Palm Beach
17	New York	42	Dayton
18	Philadelphia	43	Tampa
19	Chicago	44	Norfolk
20	Los Angeles	45	Greensboro
21	Rochester	46	Louisville
22	Hartford	47	Memphis
23	Sacramento	48	Jacksonville
24	Kansas City	49	San Antonio
25	Orlando	50	Grand Rapids

Source: Atkinson and Gottlieb (2001)

According to Atkinson and Gottlieb (2001), the top ten new economy metropolitan areas included San Francisco, Austin, Seattle, Raleigh-Durham, San Diego, Washington, Denver, Boston, Salt Lake City, and Minneapolis. These regions generated a high concentration of managers, professionals, and college-educated residents working in “knowledge jobs”, a large share of companies and residents embracing the digital economy, an innovation infrastructure (one that supports technological innovation,

including universities that graduate a large number of scientists and engineers, conduct research, and interact with companies in the region), and adapted quickly by showing a high rate of creative destruction (can shed old business practices and embrace new ones quickly). These metropolitan areas also tended to be more affluent (Atkinson and Gottlieb 2001). However, they mention that job growth is not the best measure of economic well-being because “rapidly growing metros are likely to experience rising home prices and traffic congestion, declining open space, and increasing environmental pollution, among other negative impacts.” (Atkinson and Gottlieb 2001, p. 12). Furthermore, O’Mara (1997, p. 2) concluded that “Information-age companies, which greatly rely on the quality of their work force for competitive advantage, view the quality of housing and the local community as integral parts of their operations. Communities must support the development of housing that is both affordable and attractive within a reasonable commuting range of its business sites.”

The aim of this research is to build on the existing literature by analyzing home prices, income, population growth rates, population density, employment sector, and education level within a single body of work. Analysis of this data together may determine which of these variables most impact housing affordability within a metropolitan area.

The following section of this thesis will identify potential causal factors that most significantly contribute to the geographic variation of housing affordability rates by metropolitan area. It is assumed that economic sector (i.e. professional, sales and office, and service) is not truly an explanatory variable because it does not capture the skill

levels within the workforce. Additionally, population growth rate is not believed to help explain housing affordability because there are too many factors that can impact growth (i.e. permit caps, urban growth boundaries, the review process, supply and demand of housing stock). It is hypothesized that housing affordability problems in select metropolitan areas are a result of the dynamic interaction that exists between both home prices and household incomes, while additional important explanatory variables include the educational attainment of metropolitan workers, overall population densities, and relative location as measured by Census Division.

CHAPTER III

RESEARCH DESIGN

It is hypothesized in this thesis that the spatial variation in housing affordability rate by metropolitan area can be explained by the variation in specific key independent variables including: home prices, household incomes, educational attainment, and population density.

The model will be tested across 276 metropolitan areas⁴ where the spatial units will include Metropolitan Statistical Areas (MSAs) and Consolidated Metropolitan Statistical Areas (CMSAs) as defined by the Office of Management and Budget as defined for the 2000 census. The four CMSAs located in Puerto Rico have been omitted due to the vastly differing economic characteristics of those areas. A MSA is a geographic entity defined by the federal Office of Management and Budget for use by federal statistical agencies, based on the concept of a core area with a large population nucleus, plus adjacent communities having a high degree of economic and social integration with that core. Qualification of an MSA requires the presence of a city with 50,000 or more inhabitants, or the presence of an Urbanized Area (UA) and a total population of at least 100,000 (75,000 in New England). The county or counties containing the largest city and surrounding densely settled territory are central counties of the MSA. Additional outlying counties qualify to be included in the MSA by meeting

⁴ The 2000 Census actually contains 280 metropolitan areas; however, the four Puerto Rican MAs were removed from this research due to their vastly different economic circumstances.

certain other criteria of metropolitan character, such as a specified minimum population density or percentage of the population that is urban. MSAs in New England are defined in terms of minor civil divisions, following rules concerning commuting and population density. A CMSA is a geographic entity defined by the federal Office of Management and Budget for use by federal statistical agencies. An area becomes a CMSA if it meets the requirements to qualify as a metropolitan statistical area, has a population of 1,000,000 or more, if component parts are recognized as primary metropolitan statistical areas, and local opinion favors the designation.

Table 3 is a list of the variables and their descriptions used in this analysis. All variables are derived from the US Bureau of the Census STF 1 and 3 or the 2002 Economic Census. The dependent variable in this analysis is housing affordability and is expressed as the relationship between median housing value and median household incomes. Chaplin and Freeman (1999) explain that while this ratio is the most popular measure (used internationally), it does not account for the non-housing consumption of goods. The formula for housing affordability is described as follows:

$$\text{Housing Affordability Ratio} = \frac{\text{Median housing value}}{\text{Median household income}}$$

Table 3: Variables and their Descriptions

<u>Dependent Variable</u>	<u>Description</u>
Housing Affordability	The ratio of median housing value to the household incomes of owner-occupants
Median housing value*	This measure represents the middle value (if n is odd) or the average of the two middle values (if n is even) in an ordered list of housing values and divides the total frequency distribution into two equal parts: one-half of the cases fall below the median and one-half of the cases exceed the median. Value is respondent reported.
Median Household Income*	The median income divides the income distribution into two equal groups, one having incomes above the median, and other having incomes below the median
<u>Independent Variables-Demographic and Growth</u>	
Growth Rate (1990-2000)*, **	The rate at which a population is increasing (or decreasing) in a given year due to natural increase and net migration, expressed as a percentage of the base population
Total Population*	All people, male and female, child and adult, living in a given geographic area.
Population Density*	Total population or number of housing units within a geographic entity (for example, United States, state, county, place) divided by the land area of that entity measured in square kilometers or square miles. Density is expressed as both "people (or housing units) per square kilometer" and "people (or housing units) per square mile" of land area
<u>Independent Variables-New Economy</u>	
Educational Attainment*	Refers to the highest level of education completed in terms of the highest degree or the highest level of schooling completed
Employment Sector	Taken from the 2002 Economic Census and shown as percent distribution by occupation in professional, service, and sales and office work.
<u>Independent Variables-Geographic</u>	
Regions (see Table 4)	Numbers 1 through 4 representing one of four regions of the United States
Divisions (see Table 4)	Numbers 1 through 9 representing one of nine division of the United States

*Sources: US Bureau of the Census: STF 1 and STF 3

** Growth rate between 1990 and 2000 Census data

Median housing value represents the middle value (if n is odd) or the average of the two middle values (if n is even) in an ordered list of housing values and divides the total frequency distribution into two equal parts: one-half of the cases fall below the median and one-half of the cases exceed the median. Median household income divides the income distribution into two equal groups, one having incomes above the median, and the other having incomes below the median. The resulting housing affordability ratio is the ability of all income groups to purchase housing of the type and quality they want where income determines the extent to which households can maximize housing preference. For example, it can be inferred that a metropolitan area with a housing affordability ratio score of four means that residents consume a larger portion of their household income for housing costs. Likewise a metropolitan area with a housing affordability ratio of two suggests that the housing market is more affordable because housing costs consume a smaller proportion of household income. Hypothetically, a metropolitan area with a housing affordability ratio of two may be due to a median household income of \$40,000 and a median housing value of \$80,000. By contrast, a metropolitan area with a housing affordability ratio of four may be due to a median household income of \$40,000 and median housing values of \$160,000. In the latter metropolitan area, home ownership may be more elusive even though median household income is comparable.

The independent variables that shape housing affordability and are included in this analysis are divided between various socio-economic/demographic and growth measures and new economy indicators. Some of these variables were chosen as proxy

variables because growth management is an umbrella term used to describe how a geographic unit creates policies to address each of these issues. In this research we choose metropolitan area as the geographic unit because it is the metropolitan area in which the population lives and works. Population size, population density, and population growth rate are measurable indicators of how localities address growth-based issues. Population includes all people, male and female, child and adult, living in a given geographic area. Population density indicates the amount of people per square mile of land area. This population measure can capture the extent of sprawl and may be a good surrogate indicator of whether or not a community practices growth management. In this thesis, growth rates are determined by comparing the 1990 census population size to 2000 census population levels, thus measuring the rate at which a population is increasing (or decreasing) in any given year due to natural increase and net migration.

It is assumed that highly skilled “new economy” metropolitan areas will include well-educated labor pools. Educational attainment refers to the highest level of education completed in terms of the highest degree or the highest level of schooling completed. This analysis uses the level of educational attainment (expressed as a percentage of the population who have attained a bachelors degree or higher) because this indicates the level of skill in the workforce and the potential for higher paying “new economy” employment.

The comparison of the metro-wide employment sectors can also measure the level of participation in a new economy environment. It is an important factor in analysis because it can indicate the metropolitan areas’ adaptation to new economic trends as well

as economic diversification. The new economy will be analyzed by measuring the percentage of total employment in the following types of occupations: professional, service, and sales and office. These occupational categories were chosen over industry codes because occupation can provide a better indication of an individual's skill set. For example, within a single industry code, such as manufacturing, there are employees who are involved in research and development as well as those who work the shop floor. It is assumed that each of these employees will have obtained a different level of education and skill set.

The final independent variable, used to capture regional characteristics found across the United States, included in this model are the census regions and divisions. Table 4 lists the four regions (Northeast, Midwest, South, and West) and nine divisions (New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific) as defined by the US Census Bureau.

The analysis will include a correlation of the dependent variable to each independent variable. A multiple linear regression analysis will be performed using the following methods: 1) Fit a full model with all the independent variables and conduct a diagnostic analysis using added variable plots and residual plots; 2) Check for multicollinearity (MC) using a correlation matrix, condition numbers and the variance inflation factors (VIF); 3) use forward selection, backward elimination, and stepwise selection to select a best regression equation; and finally, run a regression analysis using the best model.

Table 4: US Census Bureau Regions and Divisions		
Region 1 (Northeast)	Division 1: New England	
	Connecticut	New Hampshire
	Maine	Rhode Island
	Massachusetts	Vermont
	Division 2: Middle Atlantic	
	New Jersey	New York
	Pennsylvania	
Region 2 (Midwest)	Division 3: East North Central	
	Indiana	Wisconsin
	Illinois	Ohio
	Michigan	
	Division 4: West North Central	
	Iowa	Nebraska
	Kansas	North Dakota
	Minnesota	South Dakota
	Missouri	
Region 3 (South)	Division 5: South Atlantic	
	Delaware	North Carolina
	Maryland	South Carolina
	District of Columbia	Virginia
	Florida	West Virginia
	Georgia	
	Division 6: East South Central	
	Alabama	Mississippi
	Kentucky	Tennessee
	Division 7: West South Central	
	Arkansas	Oklahoma
	Louisiana	Texas
Region 4 (West)	Division 8: Mountain	
	Arizona	Montana
	Colorado	Utah
	Idaho	Nevada
	New Mexico	Wyoming
	Division 9: Pacific	
	Alaska	Oregon
	California	Washington
	Hawaii	

The independent variables in this model were carefully researched and based on prior research in the literature reviewed, but of course, there are limitations to this model. First of all, the proxy variables that are used for the new economy and growth management are simply crude indicators. Also, this thesis research focuses on metropolitan areas across the United States so it is important to acknowledge that the data offer limited insights to local trends nor does it explain the potential differences, which can be quite significant, within a metropolitan area.

CHAPTER IV

FINDINGS

1. The Spatial Distribution of Housing Affordability by MA.

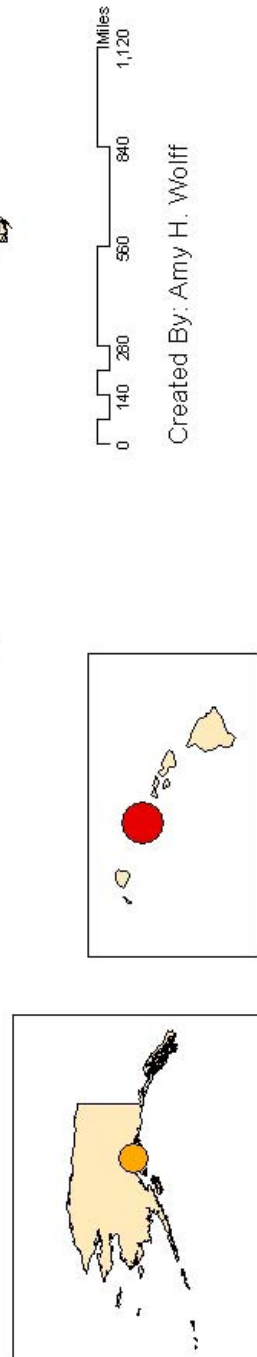
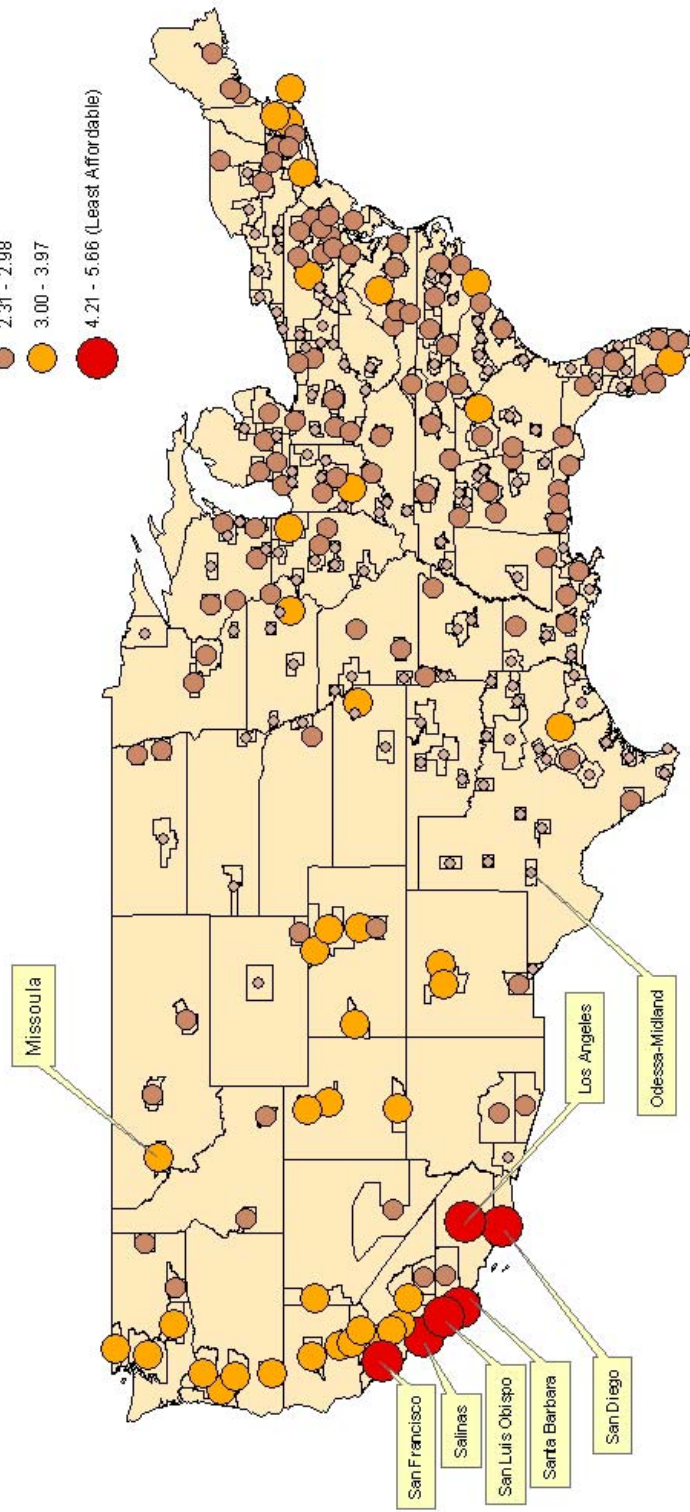
Figure 1 illustrates the spatial variation of housing affordability by metropolitan area and has been classified by natural breaks although the upper limit of the second class interval and the lower limit of the third class interval has been altered to utilize the Department of Housing and Urban Development's (HUD) definition of affordability. HUD indicates that a housing affordability ratio of less than 3 is affordable. With this alteration, Figure 1 clearly shows those metropolitan areas that are considered unaffordable; that being those metropolitan areas identified by largest class intervals. The housing affordability ratio is a broad indicator that uses median housing value divided by median household income as a proxy to measure housing affordability where a lower score indicates that the market is more affordable. The ratio has been extensively used in previous studies because it accounts for the different purchasing powers and cost of living that occur between metropolitan areas that may have very different economies.

Figure 1 clearly reveals that affordability by metropolitan area is regionally differentiated. This regionalization of housing affordability is most distinct in the West Census Region where the average housing affordability ratio is 3.34 (n=51 MAs)

Figure 1: Housing Affordability by Metropolitan Area, 2000

Housing Affordability Ratio

- 1.54 - 2.30 (Most Affordable)
- 2.31 - 2.98
- 3.00 - 3.97
- 4.21 - 5.66 (Least Affordable)



0 140 280 560 840 1,120 Miles

Created By: Amy H. Wolff

compared to a United States (n=276) average of 2.52. The geography of housing affordability for the other Census Regions is more complex and less straightforward. For example, the Northeast, Midwest, and South US Census Regions contain metropolitan areas that have a far greater range of housing affordability scores; and whose average housing affordability score is nearer to or below the average for the nation (Northeast = 2.54, Midwest = 2.31, and South = 2.29). The central and southern portion of the United States (the West South Central Census Division) appear to have a larger percentage of their metropolitan areas with lower housing affordability scores (median of 2.08, n=41) than any of the other sub-regions. Table 5 below provides the housing affordability ratio by Census-defined region and Census division.

Table 5: Housing Affordability Ratio by Census Region and Division, 2000	
	Mean Housing Affordability Ratio
United States	2.52
Northeast Region, n=35	2.54
New England, n=11	2.96
Middle Atlantic, n=24	2.36
Midwest Region, n=71	2.31
East North Central, n=44	2.34
West North Central, n=27	2.29
South Region, n=119	2.29
South Atlantic, n=55	2.43
East South Central, n=23	2.33
West South Central, n=41	2.08
West Region, n=51	3.34
Mountain, n=24	2.91
Pacific, n=27	3.72

In Figure 1, the central part of the United States broadly located within the Mississippi River basin shows a proliferation of metropolitan areas with low affordability

ratio scores indicating that the housing values in these areas are low relative to household income. More detailed regional comparisons will be presented in Chapter IV section 3 of this thesis.

1.1 Most Affordable Housing Markets by Metropolitan Area

The most affordable housing markets in the nation appear to be geographically clustered in the South Census Region and particularly the West South Central Census Division including Texas which has a significant number of metropolitan areas with low housing affordability scores. Table 6 ranks the 20 most affordable metropolitan areas. Of the 20 most affordable housing markets in the nation, 16 are located in the West South Central Division and 14 of these markets are located in Texas including five of the six most affordable markets in the nation as described by the housing affordability ratio. These metropolitan areas include Odessa—Midland, TX (1.54), Beaumont—Port Arthur, TX (1.64), and Wichita Falls, TX (1.75).

The average housing affordability ratio for the twenty most affordable metropolitan areas is 1.81 compared to a national average of 2.52. The most affordable MAs have house values that are less than twice as high as their median household incomes. It appears that the significant variation in housing values best explains the geography of housing affordability rather than the variation in median household income. For example, across the 276 MAs in this study, the average median housing value was \$100,693 while the average median household income was \$39,331. However, for

Table 6: 20 Most Affordable Metropolitan Areas, 2000				
Rank	Metropolitan Areas	Housing Affordability Ratio	Median Household Income	Median Housing Value
1	Odessa--Midland, TX MSA	1.54	34773	53500
2	Beaumont--Port Arthur, TX MSA	1.64	35669	58500
3	Pine Bluff, AR MSA	1.72	31327	53800
4	Wichita Falls, TX MSA	1.75	34098	59800
5	Abilene, TX MSA	1.76	34035	60000
6	Victoria, TX MSA	1.77	38732	68600
7	Enid, OK MSA	1.79	33006	59100
8	Decatur, IL MSA	1.81	37859	68500
9	Elmira, NY MSA	1.82	36415	66200
10	Sherman--Denison, TX MSA	1.82	37178	67800
11	Brownsville--Harlingen--San Benito, TX MSA	1.84	26155	48000
12	McAllen--Edinburg--Mission, TX MSA	1.85	24863	46000
13	Jamestown, NY MSA	1.87	33458	62700
14	Corpus Christi, TX MSA	1.88	35773	67100
15	Wichita, KS MSA	1.88	42651	80400
16	San Angelo, TX MSA	1.89	33148	62700
17	San Antonio, TX MSA	1.89	39140	74100
18	Texarkana, TX--Texarkana, AR MSA	1.90	32238	61100
19	Longview--Marshall, TX MSA	1.91	34253	65300
20	Houston--Galveston--Brazoria, TX CMSA	1.91	44761	85600
Mean Scores		1.81	34977	63440

the twenty most affordable MAs, the average median house value was significantly lower at \$63,440 while the average median household income of \$34,977 was more closely comparable to the national average.

With so many of the most affordable areas in Texas, it is possible that a large, relatively low-income Hispanic or Latino population demands lower-priced housing. For

the 14 Texas metropolitan areas listed in the most affordable top twenty, the average Hispanic or Latino population was 33.4 percent (n=14, median=29.8 percent). Nationally, the 2000 census estimates that 12.5 percent of the United States population is Hispanic or Latino. While the 14 Texas metropolitan areas have a high Hispanic or Latino market share, the percentage of Hispanic or Latino for all twenty of the most affordable areas is much lower (24.34 percent).

Other explanations for the affordability of many Texas metropolitan areas may be explained by the relatively relaxed regulatory environment that exists in Texas. Texas has a history of little or no land use regulations, and zoning was not implemented in the larger metropolitan areas until fairly recently. Development patterns in Texas are partly the result of an abundant supply of land and an automobile-dependent commute that seems to have encouraged sprawl. It is surprising that metropolitan areas as large as San Antonio (housing affordability ratio of 1.89) and especially Houston (housing affordability ratio of 1.91) are featured in the 20 most affordable metropolitan area rankings. The U.S. Census indicates that the San Antonio metropolitan area has grown 806.8 square miles between 1990 and 2000 (from 2,519.6 square miles to 3,326.4 square miles) while Houston has grown 597.59 square miles (from 7,107.4 square miles to 7,704.99 square miles) over the same period. Smart Growth America lists Houston and San Antonio among the nation's most sprawling metropolitan areas (Ewing, Pendall et al. 2002).

1.2 Least Affordable Housing Markets by Metropolitan Area

Of the 20 least affordable metropolitan areas (Table 7), 17 are located in the West Census Region (14 of which are in the Pacific Division 3.72, n=27), and seven in California. The Northeast contains the remaining three least affordable metropolitan areas listed in the top twenty ranking; including New York, Barnstable—Yarmouth, and Boston.

The average housing affordability ratio for the 20 least affordable metropolitan areas is 4.19. Compared to the national average of 2.52, these metropolitan areas have significantly higher housing costs relative to income. For example, closer examination of Table 7 shows that while it is evident that the average median household income of this group is 13 percent higher (\$45,346) than the nation's average (\$39,331), the housing values of this group are 48 percent higher (where the average median housing value for this group is \$192,140 versus \$100,693.12 for the nation).

The least affordable housing markets appear to be located along the west coast of the United States. There are seven metropolitan areas that are selected by the natural breaks method to be in the least affordable category (MAs with the highest housing affordability scores, 4.50 and above, and are shown with the largest symbols in Figure 1). These seven metropolitan areas include Santa Barbara (5.66), San Francisco (5.50), Honolulu (5.29), Salinas (5.27), San Luis Obispo (5.15), San Diego (4.50), and Los Angeles (4.21).

Table 7: 20 Least Affordable Metropolitan Areas, 2000				
Metropolitan Areas		Housing Affordability Ratio	Median Household Income	Median Housing Value
1	Santa Barbara--Santa Maria--Lompoc, CA	5.66	46677	264100
2	San Francisco--Oakland--San Jose, CA	5.50	62024	340800
3	Honolulu, HI	5.29	51914	274600
4	Salinas, CA	5.27	48305	254800
5	San Luis Obispo--Atascadero--Paso Robles, CA	5.15	42428	218600
6	San Diego, CA	4.50	47067	212000
7	Los Angeles--Riverside--Orange County, CA	4.21	45903	193400
8	Corvallis, OR	3.97	41897	166500
9	New York--Northern New Jersey--Long Island, NY--NJ--CT--PA	3.93	50795	199800
10	Santa Fe, NM	3.82	45822	174900
11	Barnstable--Yarmouth, MA	3.82	46034	175700
12	Bellingham, WA	3.74	40005	149500
13	Missoula, MT	3.74	34454	128700
14	Eugene--Springfield, OR	3.68	36942	136000
15	Seattle--Tacoma--Bremerton, WA	3.67	50733	186100
16	Chico--Paradise, CA	3.64	31924	116200
17	Medford--Ashland, OR	3.62	36461	132100
18	Boston--Worcester--Lawrence, MA--NH--ME--CT	3.57	52792	188600
19	Portland--Salem, OR--WA	3.52	46090	162200
20	Fort Collins--Loveland, CO	3.46	48655	168200
Mean Scores		4.19	45346	192140

It appears that house value has the most influence on the housing affordability score (over income). The San Francisco—Oakland—San Jose metropolitan area has a particularly high median housing value (\$340,800); it is the nation’s highest housing value by 24 percent (the next closest median housing value is Honolulu with a housing

value of \$274,600). The San Francisco area's geography (bounded by mountains and water) seems to act like a natural urban growth boundary making land values rise with demand. Additionally, the increase in high-wage high-technology economic activity clustered in this region over the last 30 years has generated a significant number of high-wage jobs; thus allowing a portion of the population to afford higher housing costs. O'Toole (2006) finds that the San Francisco Bay Area has been the least affordable housing market since 1989 and claims that urban growth boundaries and preserved areas for parks have contributed to the housing price increases.

The thesis' literature review in chapter two suggested that growth management legislation can influence the cost of housing. All of the states represented by the least affordable metropolitan areas have state-wide comprehensive growth legislation with the exception of New Mexico, Montana, and Colorado. The states with substantial legislation include California, Hawaii, Massachusetts, New Jersey, New York, Oregon, and Washington (Nelson 1995). Strategies under the growth management umbrella, such as those pioneered by California in the 1970s, include urban growth boundaries, greenbelts, and annual limits on building permits. These techniques were implemented to address growth in these states and may have contributed to the higher housing values in their metropolitan areas. O'Toole (2006, p. 2) explains that "regions with growth management planning have seen prices increase by 4 to 14 percent per year. Regions without such planning have seen prices increase by only 1 to 3 percent per year." Additionally,

Planning advocates argue that growth boundaries, greenbelts, and other restrictions are needed to preserve livability. But any benefits of these rules are dwarfed by the \$2.7 trillion cost that planning-induced housing shortages have imposed on California homebuyers. In 2005 alone, homebuyers paid penalties totaling at least \$136 billion for the privilege of owning a home in California (O'Toole, p. 3).

One of the metropolitan areas to make the list of the 20 least affordable metropolitan areas that seems out of place is Missoula, MT. The housing affordability score for Missoula was 3.74 which ranks as the 13th least affordable metropolitan area in the United States. A closer examination of the area's housing and income history reveals a similar trend as the other western metropolitan areas. The house prices in the area have been rising much faster than the resident's incomes. The Missoula metropolitan area has a median household income that is slightly lower than the average median household income on the national level; where Missoula's median household income is \$34,454 compared to \$34,977 nationally. However, Missoula's median housing value (\$128,700) is much higher than the average median across all of the nation's metropolitan areas (\$100,693). Rapid population growth combined with a limited supply of land has driven up the price of land in Missoula and has caused working-class residents to find housing elsewhere. "The average cost for a residential lot in Missoula doubled in price in the last five years" (Green 2006, p. 1). The response by Missoula's City Council was to consider subdivision tools such as planned neighborhood clusters (PNCs) and density bonuses (Green 2006). However, implementing more growth management tools may exacerbate the problem of housing affordability.

1.3. Comparison of Extremes: Odessa, TX and Santa Barbara, CA

The Odessa—Midland, Texas MA is this thesis' most affordable metropolitan area with a housing affordability ratio score of 1.54 (median household income of \$34,773 and median housing value of \$53,500). The low housing values in this metropolitan area are the main contributors to this low ratio. Odessa—Midland has a Hispanic/Latino population of 35.8 percent which is much higher than the national average of 12.5 percent. This statistic's importance is reflective of a demographic trend in Texas where Hispanic/Latino migrants are growing more rapidly than any other ethnic group (Peterson and Assanie 2005). Fullerton (2001) argues that these migrants are less educated and pose a challenge for Texas since its fastest growing economic sectors typically require higher levels of education. Hispanic laborers in Texas with lower levels of education and lower levels of incomes may contribute to lower housing costs simply due to the lack of demand for more expensive housing units.

By contrast, the Santa Barbara MA is this thesis' least affordable area with a housing affordability ratio of 5.66 (median household income of \$46,677 and median housing value of \$264,100). Surprisingly, Santa Barbara's population is 34.2 percent Hispanic/Latino which is comparable to Odessa—Midland (35.8 percent). For all the California metropolitan areas included in this study, the average Hispanic and Latino population share was 29.77 percent.

By comparing the most and least affordable metropolitan area by Hispanic or Latino percentages it becomes clearer that ethnicity may not be a major determining

factor when metropolitan area housing affordability ratios are analyzed. However, it is possible that unaffordable areas with large Hispanic or Latino populations have a dual labor market, each with markedly different income levels and housing situations. For example, low wage Hispanic or Latino laborers may commute considerable distances in the least affordable metropolitan areas in order to access low-wage entry-level opportunities in the economic centers of these regions; the less expensive housing (the only housing this group can afford) is typically located in the rural periphery where few jobs are found. Of course, further research is needed to fully evaluate the impact of significant Hispanic or Latino ethnic groups on the variation in affordability in different regions of the United States.

Table 8 compares the most and least affordable metropolitan areas in our study for a wide variety of socio-economic indicators. Only marginal differences are revealed in employment by economic sector. For example, both metropolitan areas show very similar percentages of their populations employed in the service sector; Odessa—Midland with 16 percent and Santa Barbara with 17 percent although the service category covers a broad range of employment descriptions. Based on the education level in each of these metropolitan areas (Odessa—Midland with 18 percent and Santa Barbara with 29 percent of the population with a Bachelor's degree or higher) variations in skill levels may play an important role in the determination of the type of service industries that are present. Data processing is a service industry that could require a higher level of education compared to say janitorial services. Although the percentage of people employed in each of these occupations may be similar, a higher level of education could

Table 8: Comparison of the Two Extremes: Odessa, TX and Santa Barbara, CA, 2000		
	<u>Most Affordable</u> Odessa, TX	<u>Least Affordable</u> Santa Barbara, CA
Housing Affordability Ratio	1.54	5.66
Median Housing Value	\$53,500	\$264,100
Population Growth Rate: 1990 - 2000	99%	8%
Population	237,132	399,347
Educational Attainment (BA or greater)	18%	29%
Median Household Income	\$34,773	\$46,677
Mean Annual Wage Estimate*	\$31,340	\$40,190
Population Density (persons per square mile)	131.6	145.9
Economic Sector		
Professional Employment	29%	35%
Sales and Office Employment	29%	25%
Service Employment	16%	17%

*All data derived from 1990 or 2000 census data per Table 1 except Mean Annual Wage Estimate which is taken from the May 2005 Metropolitan Area Occupational Employment and Wage Estimates from the Bureau of Labor Statistics.

be required for data processing services. However, it is not these services alone that provides a clear explanation of the types of employment in each metropolitan areas because, according to the 2002 US Economic Census, California has 14.2 percent of the US market for data processing services and 12.7 percent for janitorial services. The Texas share is 10.4 percent and 7.4 percent respectively for these service industries.

However, by considering the educational attainment and wage estimates for Odessa—Midland and Santa Barbara it becomes clearer that the type of employment in each of these areas could be vastly different. The difference in the percentage of the population in each of these areas with a Bachelor's degree or higher may explain the wage differential even though the economic sector composition is markedly similar.

Also, for the two metropolitan areas, a surprising result is the substantial difference between the population growth rates of Odessa—Midland (i.e. 99 percent) and the growth rate of Santa Barbara (i.e. 8 percent). Odessa—Midland is located in a state that has relatively few development regulations, thus allowing the metropolitan area to grow at a faster rate. By contrast, California and its metropolitan areas have strict regulations for development which can significantly constrain land supply.

As discussed previously, California is also a growth management state that utilizes growth management tools such as urban growth boundaries, greenbelts, and annual limits on building permits; all of which contribute to higher costs of development. Urban growth boundaries (UGBs) are used to redirect development back toward city centers for the purposes of preserving surrounding land for agriculture or other open-space uses (Nelson 1995). When development is prohibited in these areas, demand for land increases causing the land value to increase which can lead to higher development costs. Greenbelts essentially cause the same effect by placing mandatory buffers between areas of development to preserve environmentally sensitive areas (Nelson 1995). One of the most onerous of all regulatory limitations on development is the implementation of building permit caps. Generally this practice is implemented in an area that has already experienced significant development pressures. Such a pressure can trigger significant house price increases and may also infringe upon the constitutional right of the landowner.

1.4 Regional Differences

Comparing the broad indicators for only two metropolitan areas (i.e. Odessa—Midland and Santa Barbara) cannot provide a definitive answer regarding national trends in the spatial variation of housing affordability rates. Table 9 presents the broad trends and socio-economic indicators for each of the four Census regions. As discussed earlier, the least affordable region is the West Census Region with a housing affordability ratio of 3.34 compared to a low of 2.29 in the South Census Region. Broadly speaking, it is clear that the regional variation in median housing value is the primary factor for the geographic variation in housing affordability ratio by Census Region given the marginal differences in median household income by Census Region.

Table 9 also presents two interesting trends. Besides the substantial differences in the average housing affordability ratio, substantively different trends are noted regarding the mean population growth rate and population density between the Census regions. By region, the population growth rate varies greatly. The growth rates are notably higher in the Sunbelt region relative to the Rustbelt which should not be surprising given the considerable populations shifts of the last two decades. Growth management regulations may have lessened Santa Barbara's growth relative to Odessa, as evident in the previous comparison between the extreme metropolitan areas; the same conclusion is not evident at a regional scale. With respect to regional differences in population density, the fast-growing regions of the South and West are less densely populated than the slower-growing metropolitan areas of the densely settled Northeast and Midwest Census regions. The conclusion here is that the higher house values appear to occur where land is less

densely settled – a counter-intuitive finding. Some of this lower-density phenomenon in the West, however, is explained by the larger land areas by county in these western metropolitan areas.

Table 9: Regional Comparisons, 2000 (Value = Mean of all MAs in each Region)				
	Northeast	Midwest	South	West
Housing Affordability Ratio	2.54	2.31	2.29	3.34
Median Household Income	\$40,733	\$41,476	\$36,902	\$41,053
Median Housing Value	\$105,483	\$96,476	\$84,893	\$140,143
Population Growth Rate (1990 to 2000)	5%	14%	24%	26%
Population	1,388,158	671,997	769,571	1,080,062
Population Density (persons per square mile)	451	284	259	202
Educational Attainment (BA or greater)	23%	24%	22%	25%
Employment Sector				
Professional Employment	33%	32%	31%	33%
Service Employment	16%	15%	16%	16%
Sales and Office Employment	27%	27%	27%	27%

Table 9 also reveals similarities between the Census Regions in terms of median household income, educational attainment, and employment composition. Across three of the four Census Regions average median household income varies a mere \$743 (Midwest = \$41,476, West = \$41,053, Northeast = \$40,733). The South has the lowest median household income (\$36,902) which is 11 percent less than the nation's highest average median household income.

Regional comparisons in Table 9 show similar labor compositions for employment categories. For example, the percentage of the population employed in the

sales and office sector across all four Census regions is identical at 27 percent. Service sector employment is nearly identical across the regions with three of the four showing 16 percent employment (the Midwest has 15 percent of its workforce employed in the service sector). The professional employment sector shows the greatest range, of the three employment sectors, across the four Census Regions; ranging from 31 percent in the South to 33 percent in the Northeast and West. The similarities in labor composition may be a result of this analysis using only three broad-ranging employment categories (i.e professional, service, and sales and office). Additionally, the quality of work being performed across the regions cannot be ascertained from employment sector percentages alone. If analyzed in conjunction with income levels, one might conclude that there is a higher level of value-added employment in those regions that have a higher level of educational attainment due to the higher incomes being earned.

1.5 The New Economy and Housing Affordability

The literature review for this thesis shows that the New Economy may be directly affecting housing costs because it has been shown that high skilled labor markets tend to be those same metropolitan areas faced with acute housing affordability problems. According to Atkinson and Gottlieb (2001, p. 3) the New Economy “ is a global knowledge and idea-based economy where the keys to wealth and job creation are the extent to which ideas, innovation, and technology are embedded in all sectors of the economy – services, manufacturing, and agriculture.” For this reason, it is evident that this economic sector analysis masks the quality of jobs being performed even though new

economy positions are often classified as managerial, professional and technical in nature (hence this thesis' inclusion of the professional, service, and sales and office employment sectors as variables in the analysis).

The three employment sectors are shown to be comparable across regions – especially sales and office. Even though the number of jobs by employment sector may be comparable, the skills and earnings vary. The variation in skills (educational attainment) and earnings (median household income) is evident in Table 9. Furthermore, it is also shown that the percentage of educational attainment is directly proportional to median household income by region; as educational attainment increases, median household income also increases.

Table 10 identifies the Census region and division for each of the top 50 New Economy cities as identified by Attkinson and Gottlieb (2001). Considering the New Economy metropolitan areas, we see that nearly half are located in the South Census Region (21 out of the top 50) and only 10 are located in the West Census Region. This finding seems contrary to the widely believed relationship that the new economy metropolitan areas have the highest levels of educational attainment because the South has the lowest level of educational attainment in this study (22 percent) and the West has the highest level of educational attainment in this study (25 percent). O'Mara's (1997) study found that the New Economy industries "which greatly rely on the quality of their work force for competitive advantage, view the quality of housing and the local

Table 10: New Economy Ranking, 1999					
RANK	Metropolitan Area	Region	RANK	Metropolitan Area	Region
8	Boston	Northeast	14	Houston	South
17	New York	Northeast	25	Orlando	South
18	Philadelphia	Northeast	26	Richmond	South
21	Rochester	Northeast	30	Charlotte	South
22	Hartford	Northeast	32	Nashville	South
31	Buffalo	Northeast	38	New Orleans	South
37	Pittsburgh	Northeast	39	Oklahoma City	South
10	Minneapolis	Midwest	41	West Palm Beach	South
19	Chicago	Midwest	43	Tampa	South
24	Kansas City	Midwest	44	Norfolk	South
27	St. Louis	Midwest	45	Greensboro	South
28	Detroit	Midwest	46	Louisville	South
29	Indianapolis	Midwest	47	Memphis	South
33	Cleveland	Midwest	48	Jacksonville	South
34	Cincinnati	Midwest	49	San Antonio	South
36	Columbus	Midwest	1	San Francisco	West
40	Milwaukee	Midwest	3	Seattle	West
42	Dayton	Midwest	5	San Diego	West
50	Grand Rapids	Midwest	7	Denver	West
2	Austin	South	9	Salt Lake City	West
4	Raleigh-Durham	South	15	Portland	West
6	Washington	South	16	Phoenix	West
11	Atlanta	South	20	Los Angeles	West
12	Dallas	South	23	Sacramento	West
13	Miami	South	35	Las Vegas	West

Source: Atkinson and Gottlieb (2001)

community as integral parts of their operations. Communities must support the development of housing that is both affordable and attractive within a reasonable commuting range of its business sites.” The New Economy industries appear to be looking to the South in order to create their perceived competitive advantage anew with the hopes of attracting educated workers.

It is clear from Figure 1 and this analysis that geography matters. The next section of these findings will show the spatial distribution of educational attainment by

metropolitan area as well as the spatial distribution of population density and consider the differences and patterns that are revealed. The statistical analysis indicated that the highest correlation scores with housing affordability ratio by metropolitan area included educational attainment (percent of the population with a BA degree or higher), professional employment (percent of the population employed in the professional sector), and population density.

2. Spatial Distribution of Educational Attainment by Metropolitan Area

The spatial distribution of educational attainment by metropolitan area in Figure 2 indicates that the more educated metropolitan areas are found in the eastern half of the United States with clusters of MAs with higher education levels along the east coast, upper mid-west and eastern Texas. Figure 2 has been classified by natural breaks with 27 metropolitan areas classified in the highest-educated category; which includes 33.26 percent to 47.6 percent of the metropolitan population who have obtained a bachelor's degree or higher.

Table 11 is a list of the top ten ranked metropolitan areas with the highest educational attainment. Iowa City, IA leads the nation's metropolitan areas with the highest educational attainment at 47.6 percent and Merced, CA ranks at the bottom with 11.05 percent. It is noted that the top-ranked metropolitan areas for educational attainment are notably university/college areas where one might expect a higher level of educational achievement among the population at large. The average educational attainment level across all 276 metropolitan areas in this analysis was 23 percent.

Figure 2: Educational Attainment by Metropolitan Area, 2000

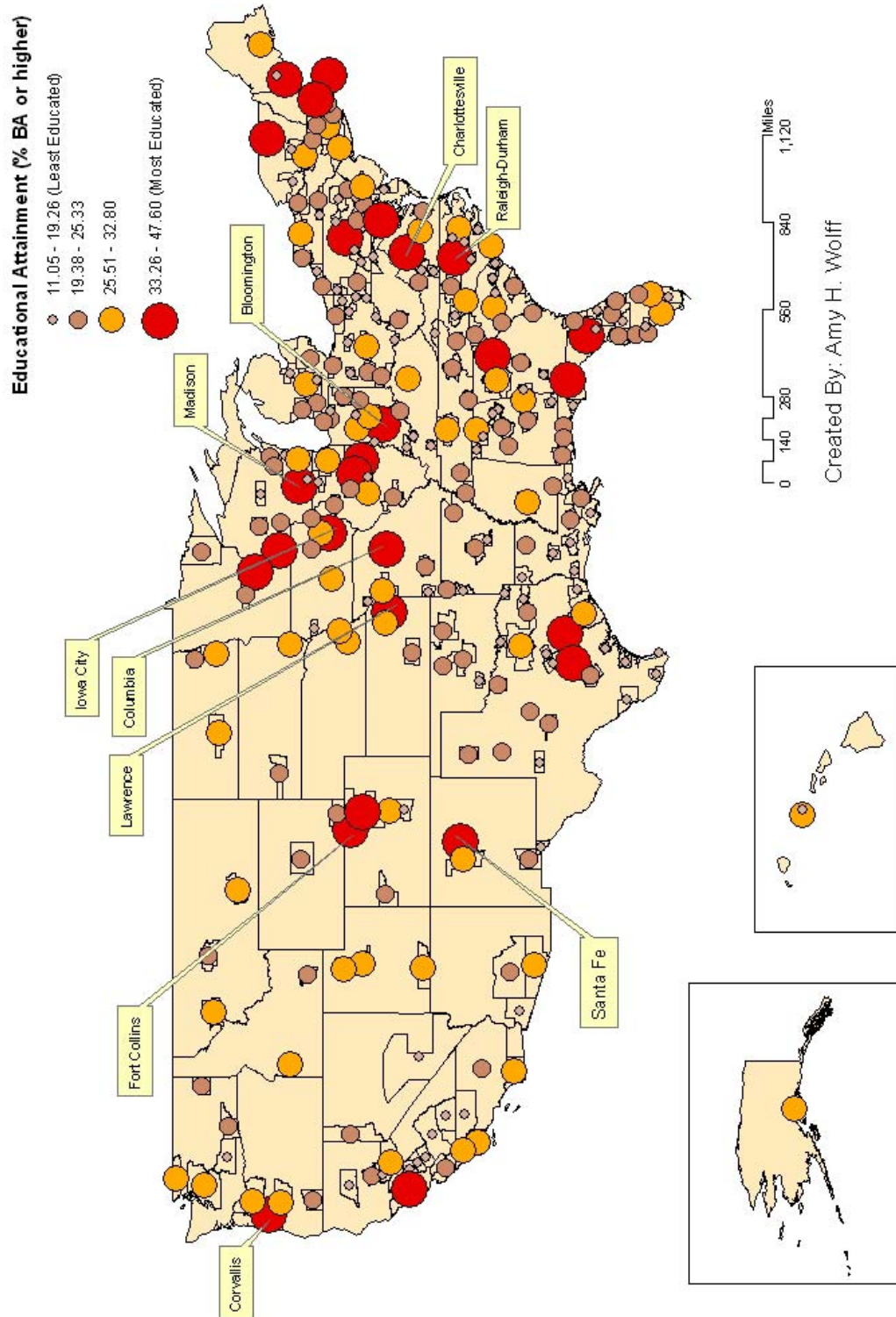


Table 11: Top 10 Metropolitan Areas by Educational Attainment, 2000 (% BA or higher)		
Rank	Metropolitan Area	Educational Attainment (%)
1	Iowa City, IA	47.6
2	Corvallis, OR	47.4
3	Lawrence, KS	42.7
4	Columbia, MO	41.7
5	Madison, WI	40.6
6	Charlottesville, VA	40.1
7	Santa Fe, NM	39.9
8	Bloomington, IN	39.6
9	Fort Collins--Loveland, CO	39.5
10	Raleigh--Durham--Chapel Hill, NC	38.9

3. Spatial Distribution of Population Density by Metropolitan Area

Figure 3 illustrates the spatial distribution of population density by metropolitan areas indicating that the most densely settled metropolitan areas are found in the Northeast with an additional cluster of high density metropolitan areas in the Great Lakes region and another cluster located in Florida. Figure 3 has been classified by natural breaks with 15 metropolitan areas falling into the most densely settled category; that being 747 to 2029 persons per square mile. Table 12 illustrates the top ten metropolitan areas by population density. New York is the most densely settled with 2029 people per square mile and Flagstaff, AR is the least densely settled with 5 people per square mile. The average population density across all 276 metropolitan areas was 279 people per square mile.

Figure 3: Population Density by Metropolitan Area, 2000

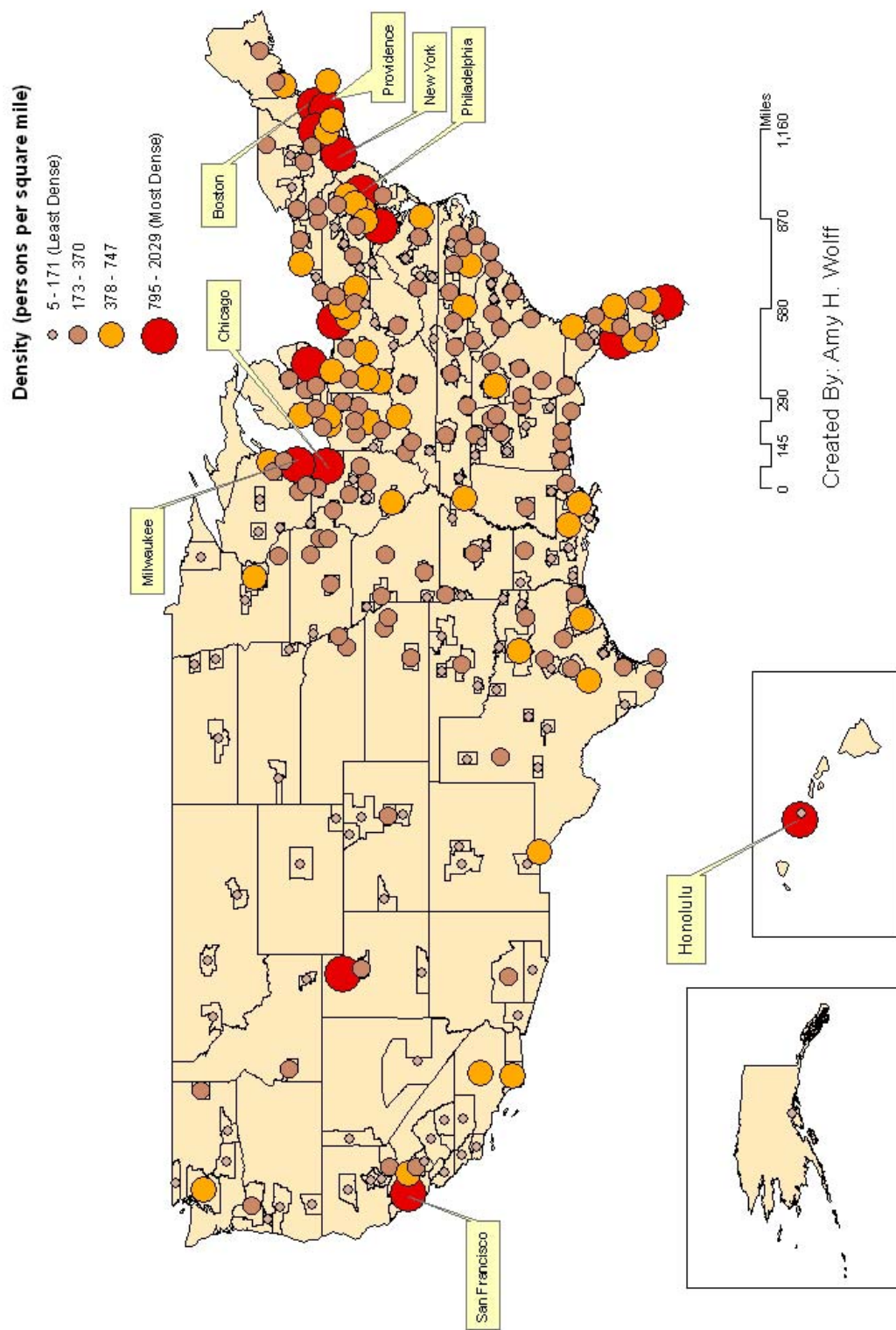


Table 12: Top 10 Metropolitan Areas by Population Density, 2000		
Rank	Metropolitan Areas	Population Density (persons per square mile)
1	New York--Northern New Jersey--Long Island, NY--NJ--CT--PA	2029
2	Honolulu, HI	1461
3	Chicago--Gary--Kenosha, IL--IN--WI	1322
4	Miami--Fort Lauderdale, FL	1230
5	Philadelphia--Wilmington--Atlantic City, PA--NJ--DE--MD	1043
6	Providence--Fall River--Warwick, RI--MA	1042
7	Boston--Worcester--Lawrence, MA--NH--ME--CT	1034
8	San Francisco--Oakland--San Jose, CA	955
9	Milwaukee--Racine, WI	942
10	Tampa--St. Petersburg--Clearwater, FL	938

The Northeast region metropolitan areas contain older central cities whose development patterns are much denser than the newer development patterns of the Sunbelt metropolitan areas given the prevailing form of transportation at the time of development. For example, the Northeast's older and larger cities such as New York, Boston, and Philadelphia are densely populated due to the heavy reliance on public transit systems and the mixed-use morphology that prevailed before the advent of the automobile. The same can be said for the Great Lakes and San Francisco metropolitan areas that are also classified as the most densely settled.

The next section of this thesis will present the additional statistical analysis of the most significant variables that explain the spatial variation of housing affordability by metropolitan area.

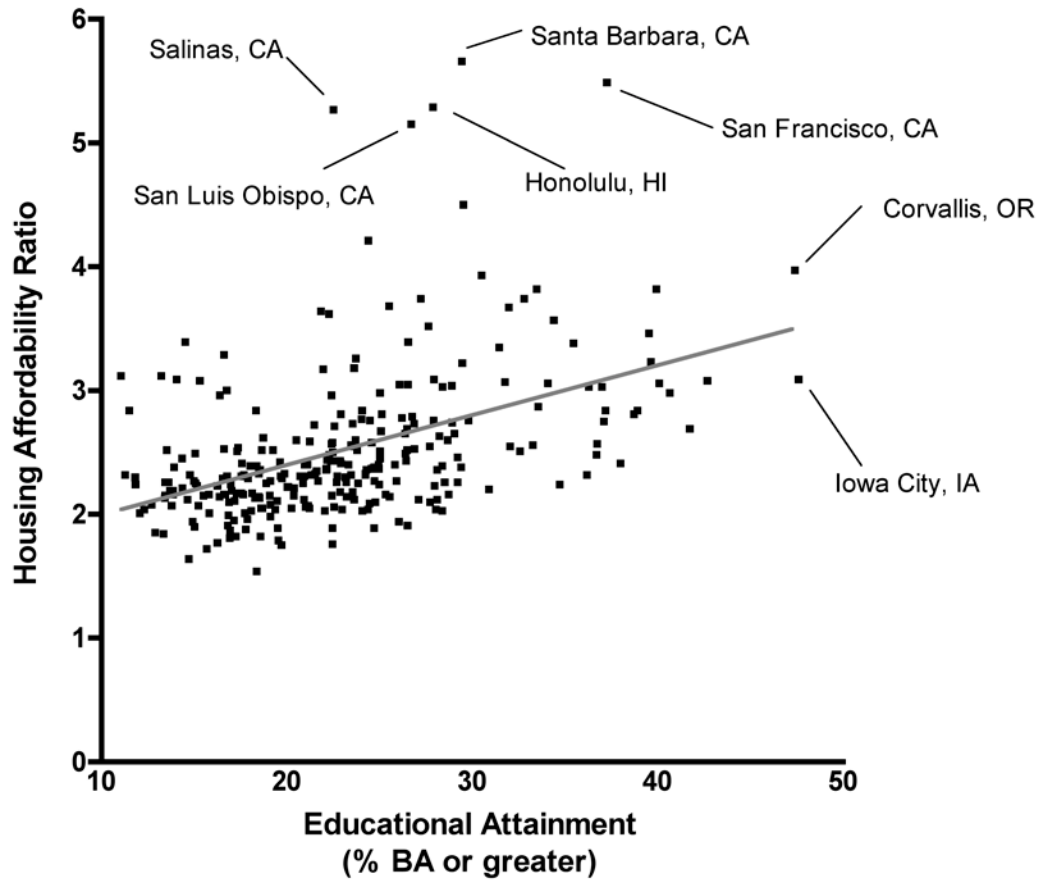
4. Statistical Analysis

To begin the statistical analysis, four scatterplots are presented that show the correlation of housing affordability ratio by metropolitan area to educational attainment, professional employment, population density, and growth rate by metropolitan area. Other variables analyzed include the two remaining economic sectors: the service industry, and sales and office employment.

4.1 Relationship Between Housing Affordability and Educational Attainment

The level of educational attainment by metropolitan area generated the highest correlation coefficient score relative to the housing affordability. The Pearson's Correlation coefficient was 0.45 at the 1 percent level of significance. Pearson's was used in this thesis because of the relatively normal distribution curve and low standard deviations for the data. Figure 4 is a scatter plot of the housing affordability ratio and educational attainment by metropolitan area suggesting a strong linear relationship exists between the two variables. As educational attainment levels increase there is likely to be fewer affordable housing units in that metropolitan market. The implication is that well-educated metropolitan areas likely support significant wage earnings due to the superior

Figure 4: Housing Affordability and Educational Attainment by MA



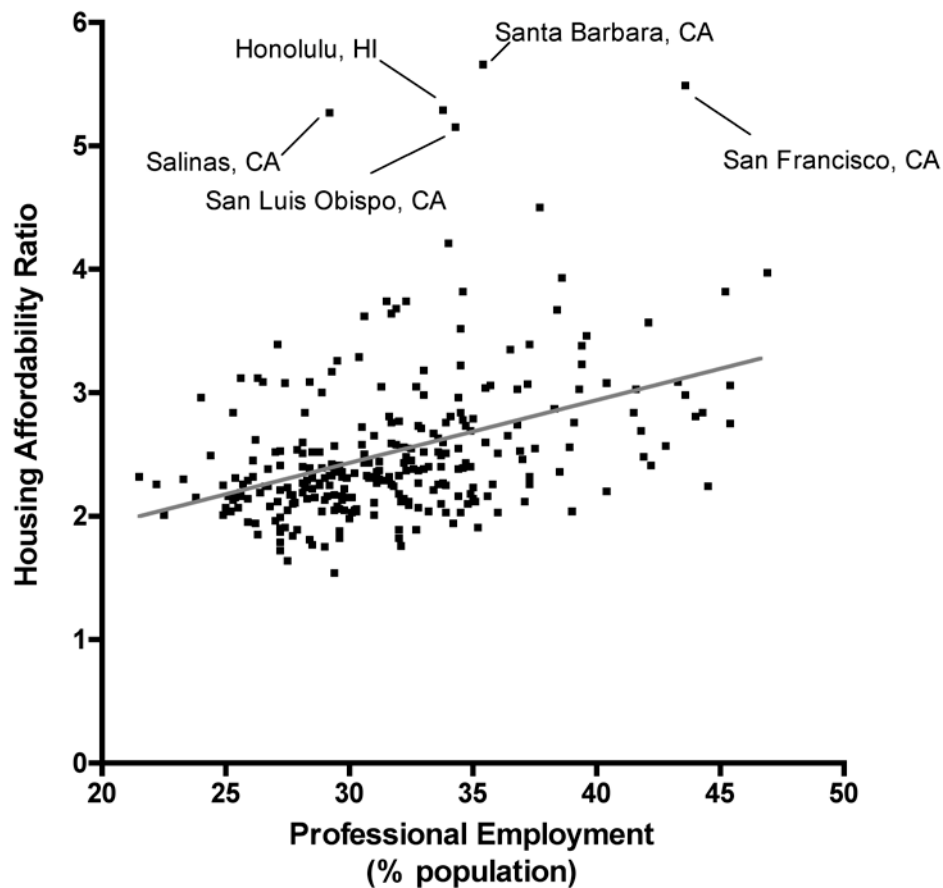
skill levels in the labor market. The elevated earning powers probably contribute to an increased demand for more expensive housing units.

Most of the significant outliers in the scatterplot are the West coast metropolitan areas and include Salinas, CA (educational attainment = 22.5 percent), Honolulu, HI (educational attainment = 27.9 percent), and Santa Barbara, CA (educational attainment = 29.4 percent).

4.2 Relationship Between Housing Affordability and Professional Employment

The population share that is employed in the professional sector by metropolitan area generated the second highest correlation coefficient score relative to the spatial variation in housing affordability. The correlation score was 0.40 at the 1 percent level of significance. Figure 5 is a scatter plot of the housing affordability ratio and professional employment by metropolitan area suggesting that a fairly strong linear relationship exists between the two variables. As the percentage of the population in a metropolitan area

Figure 5: Housing Affordability and Professional Employment by MA



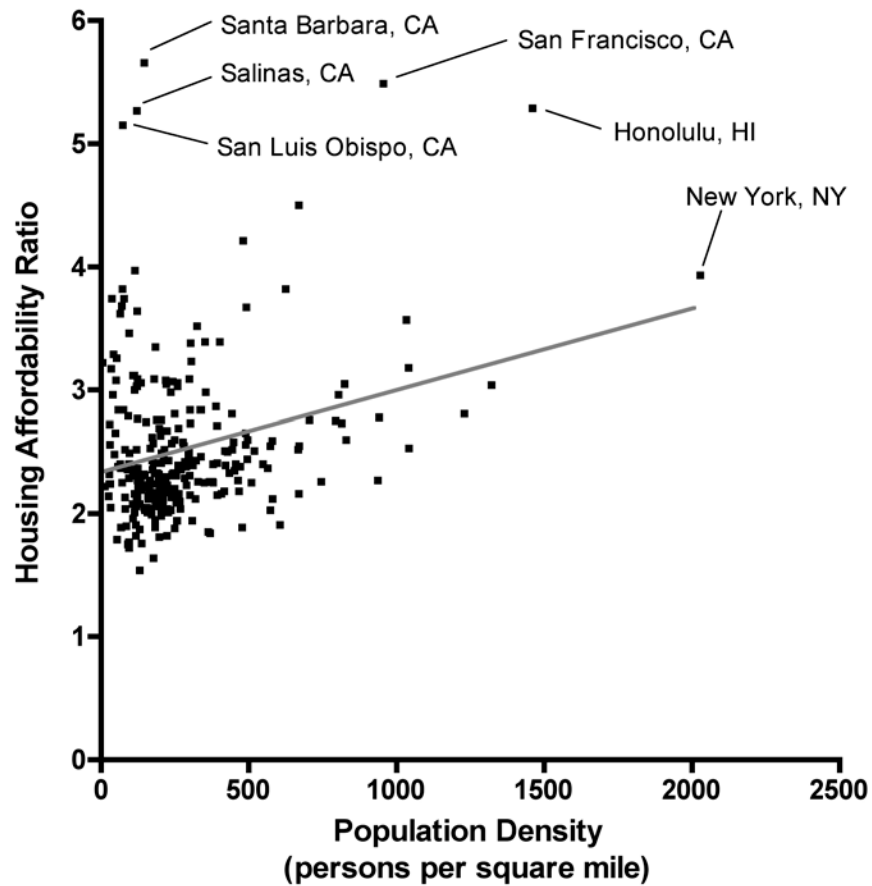
that is employed in the professional sector increases, housing becomes less affordable. As with high levels of educational attainment, a higher percentage of professionals in a metropolitan area can cause an increased demand for higher-end housing due to the higher earning power of employees in this economic sector.

Most of the significant outliers in this scatterplot are also West coast metropolitan areas and include Salinas, CA (percent professional employment = 29.2), Honolulu, HI (percent professional employment = 33.8), and Santa Barbara, CA (percent professional employment = 35.4).

4.3 Relationship Between Housing Affordability and Population Density

Population density by metropolitan area generated a lower correlation coefficient score of 0.27 at the 1 percent level of significance. Figure 6 is a scatter plot of the housing affordability ratio and population density by metropolitan area which suggests that, although a linear relationship exists between the two variables, it may not be as strong as those lines of best fit for educational attainment and the percentage of the labor force in professional employment. As population density increases the trend line shows a higher housing affordability ratio meaning there is likely to be fewer affordable housing units in that metropolitan market. In a relatively normal housing market, high housing unit densities often suggest a higher demand for land; as demand for land increase, land values tend to rise in a similar fashion. Thus, developers build more units per acre in order to offset the price of land and recoup the cost of land when the houses are sold.

Figure 6: Housing Affordability and Population Density by MA

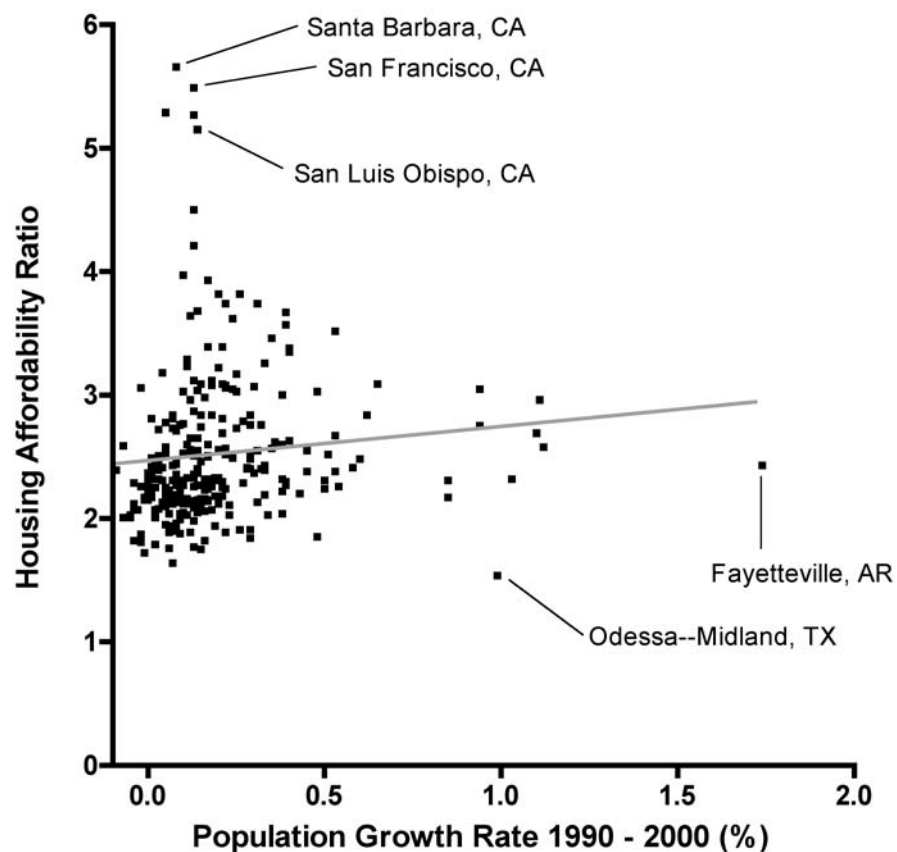


Similar to Figure 4 and Figure 5, it is the least affordable metropolitan areas that show the most deviation from the line of correlation. These outliers include Santa Barbara, CA (density = 146), San Francisco, CA (density = 955), and Honolulu, HI (density = 1461).

4.4 Relationship Between Housing Affordability and Population Growth Rate

The literature review in this thesis indicated that housing affordability in a metropolitan area may be explained by that area's growth rate. However, the correlation coefficient of 0.10 was not significant suggesting that the empirical findings in this thesis indicate that growth rate did not significantly contribute to any explanation of the variation of housing affordability. A visual inspection of the scatterplot in Figure 7 also indicates that a weak relationship exists between these two variables.

Figure 7: Housing Affordability and Population Growth Rate by MA



The existing literature linking population growth rate to housing affordability is divided; where several studies indicate that a high population growth rate can lead to more expensive housing and others suggest that a high population growth rate indicates increased availability of affordable housing and higher mobility. Most of these studies, however, acknowledge that housing cost is a product of supply and demand and that different markets have different regulatory mechanisms to address growth (i.e. some metropolitan areas encourage growth and other metropolitan areas discourage growth). Metropolitan areas that discourage growth but are also experiencing growth, tend to have higher housing values (i.e. the California metropolitan areas in this study). On the contrary, metropolitan areas that appear to encourage growth (i.e. the Texas metropolitan areas in this study) tend to have lower housing values.

The existing literature linking population growth rate to housing affordability has mixed findings. Several studies indicate that a high population growth rate can lead to more expensive housing and others suggest that a high population growth rate indicates an increased availability of affordable housing that attracts new migrants. Most of these studies, however, acknowledge that housing cost is a product of supply and demand and that different markets have different regulatory mechanisms to address growth (i.e. some metropolitan areas encourage growth and other metropolitan areas discourage growth). Metropolitan areas that have experienced a recent history of rapid growth and then try to manage that growth by introducing permit caps, urban growth boundaries and tough growth management legislation tend to be the same metropolitan areas experiencing high

housing values and above average housing affordability ratios (i.e. the California metropolitan areas in this study). On the contrary, metropolitan areas that appear to encourage growth (i.e. the Texas metropolitan areas in this study) tend to have lower housing values.

4.5 Regression Analysis

It is shown above that the variables most closely correlated to our housing affordability ratio are educational attainment, professional employment, and population density. A regression analysis is used here to provide an additional explanation of the effect of the housing affordability ratio when these variables interact. This research hypothesized that the housing affordability ratio by metropolitan area can be explained by variation in specific key independent variables including: home prices, household incomes, educational attainment, and population density. Other independent variables that may explain housing affordability include the population growth rate and employment composition (the percentage of the population employed in professional, service, and sales and office occupations). Through regression analysis it is determined that the significant independent variables in this thesis included educational attainment and population density. Although population growth rate has been heavily linked to housing affordability in the literature, it was left out of the final regression model due to its low correlation score and lack of statistical significance. Also, because of the high correlation between educational attainment and the percentage of the population

employed in the professional sector⁵ (0.94 at the 1 percent level), only educational attainment was included in the final regression model.

The literature review indicated that geographic region may also explain some of the variation in affordability across metropolitan areas. Categorical variables for Census Region⁶ and Division⁷ were added to the model with the thinking here that the regression model is strengthened by including a geographic component. It should be noted that Census Division was ultimately chosen since it is more geographically disaggregated than Census Region. The following is the final model of the regression analysis for this thesis and Table 13 presents the detailed results:

$$\text{HAR} = 0.89 + 0.00072 \text{ density} + 0.0355 \text{ education} + 0.1179 \text{ Census Division}$$

$$\text{R-square} = 0.41$$

$$\text{F-Statistic} = 62.01 \text{ at the 1\% level}$$

This final regression provides a model that shows the line of best fit with the y-intercept (0.89) and regression coefficients for density (0.00072) and education (0.0355).⁸

The regression coefficient represents the amount the dependent variable will change when the corresponding independent variable changes by one unit. Here, with all else

⁵ When both educational attainment and professional employment were included in the regression model each had a VIF greater than 9; indicating a multicollinearity problem. Consequently when only educational attainment was included in the model its VIF was 1.05.

⁶ Coded variables for Census Regions are as follows: 1=Northeast, 2=Midwest, 3=South, and 4=West.

⁷ Coded variables for Census Divisions are as follows: 1=New England, 2=Middle Atlantic, 3=East North Central, 4=West North Central, 5=South Atlantic, 6=East South Central, 7=West South Central, 8=Mountain, and 9=Pacific.

⁸ The regression coefficient for Census Division cannot be interpreted in the same way because coded variables were used as opposed to a continuous variable in the multiple linear regression model (as opposed to a logistic regression model). It is assumed that the Census Division of a metropolitan area will be held constant.

constant, if density increases by one unit in a metropolitan area, its housing affordability ratio is predicted to increase by 0.00072. Likewise, if educational attainment were to increase by one unit in any given metropolitan area, its housing affordability ratio is predicted to increase by 0.0355.

Table 13: Housing Affordability Ratio Regression Output, Final Model				
Variable	Parameter Estimate	Standard Error	t Statistic	P-value
Intercept	0.89	0.1252	7.127	<.001
DENS	0.00072	0.0123	5.854	<.001
EDUC	0.0355	0.0043	8.321	<.001
DIV	0.11785	0.0133	8.884	<.001

Through this regression analysis it has been determined that 41 percent (R-square) of the variation in housing affordability by metropolitan area can be explained by three variables: educational attainment, population density, and Census Division. This best-fit model emphasizes that, across all 276 metropolitan areas, the traditional indicators of educational attainment and population density prevail over different types of economic sectors and employment composition even though some of the existing literature has suggested these employment/economic issues may be a leading cause of housing affordability problems. Additionally, this model illustrates the significant influence of the relative location of a metropolitan area. For example, when the Census Division variable is removed from the model the R-squared value drops nearly 18 percent (from 41 percent to 23 percent). Visual inspection of Figure 1 reinforces this finding where those metropolitan areas with the highest housing affordability scores (i.e. least affordable) are

geographically clustered on the West coast and the lowest housing affordability scores (i.e. most affordable) are clustered in the southern Mississippi River basin.

CHAPTER V

CONCLUSION

This thesis hypothesized that housing affordability problems in select metropolitan areas are a result of the dynamic interaction that exists between both home prices and household incomes while additional important explanatory variables include the educational attainment of the metropolitan workers, overall population densities and relative location as measured by Census Division. In this analysis, a housing affordability ratio (expressed as the relationship between median housing value and median household incomes) was used as a proxy to measure housing affordability. This ratio made it possible to correct for different purchasing powers that occur between metropolitan areas with very different economies.

The first key finding in this thesis is the clear regionalization of housing affordability. The metropolitan areas with higher housing affordability ratios (least affordable) are concentrated along the West Coast and the metropolitan areas with lower housing affordability ratios (most affordable) are concentrated in the lower Mississippi River basin. The second key finding is that housing affordability is determined more by the variation in house values than by the variation in household incomes; where, across all metropolitan areas there is little variation in household income relative to the variation found for house values. This finding is consistent with the existing literature reviewed in this thesis and also parallels the results of a recent 2006 Census Bureau study which

found that “Nationwide, median home values jumped 32 percent from 2000 to 2005...[and] household incomes have not kept up, dropping 2.8 percent during the same period” (Ohlemacher 2006).

The final regression model shows that the key triggers of our model are educational attainment, population density and Census Division. These variables interact in such a way as to explain 41 percent of the variation in the housing affordability ratio by metropolitan area. The non-significant variables tested included population growth rate and employment composition in ‘new economy’ industries. These results imply that the high-technology jobs that typically characterize the New Economy may be embedded in other traditional industries (i.e. innovations in research and design for manufacturing processes). Consequently, conventional measures of employment composition may be less helpful in explaining variations in housing affordability ratios than simple crude overall measures of the workforce’s skill levels as measured by overall levels of education attainment. The implication is that well-educated workers realize higher average wages and, thus, bid-up the prices of houses. However, not all workers are able to participate in this process as evidenced by the lack of variation in median household incomes across metropolitan areas when compared to average housing prices

This thesis did not find that population growth rate was a significant indicator of housing affordability across metropolitan areas. This is likely due to the vastly different regulatory powers that are exercised in some jurisdictions and not in others; causing some jurisdictions to purposefully hinder growth while others encourage it.

This thesis focused on metropolitan areas across the United States. It is acknowledged that to reach a clearer understanding of affordability, further analysis is needed. Future research should examine housing affordability ratios within specific metropolitan areas to determine if those metropolitan areas that are considered less affordable generate ‘ghettoized’ pockets of affordable housing in specific housing sub-markets within the metropolitan area. The significant variation in house prices relative to the lack of variation in household incomes suggest that some metropolitan workers in low-wage occupations face significant challenges if they are to become home-owners. A more detailed disaggregation of specific metropolitan housing markets may be helpful in this regard. Additionally, more research is needed to determine if growth management is solely the cause of higher housing costs in select markets. And finally, the second largest allocation of a household budget is taken up by transportation costs. For a more refined assessment of affordability, transportation costs should also be examined because the suspicion here is that some low-income workers must endure substantial commutes in order to access affordable housing in the extreme outlying areas of a metropolitan market that is dominated by high priced housing in the urban core areas.

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Appendix A: DATA SET

Metropolitan Area	HAR	MH Income	HM Value	Growth (90-2000)	Population Density	Education (>=BA)	Professional	Service	Sales/ Office	Region	Division
Ablene, TX MSA	1.76	34035	60000	0.06	138.2	0.2245	32.1	19.5	26.9	3	7
Albany, GA MSA	2.16	34829	75400	0.07	176.3	0.1765	29.7	16	27.6	3	5
Albany--Schenectady--Troy, NY MSA	2.36	43250	102200	0.00	271.7	0.281	38.5	14.2	27.9	1	2
Albuquerque, NM MSA	3.03	39088	118500	0.48	119.9	0.284	36.8	15.7	28.1	4	8
Alexandria, LA MSA	2.29	29856	68300	-0.04	95.5	0.1655	31.4	18.6	26.5	3	7
Allentown--Bethlehem--Easton, PA MSA	2.59	43098	111600	-0.07	579.2	0.2124	31.7	14.1	27	1	2
Altoona, PA MSA	2.16	32861	71100	-0.01	245.6	0.1388	25.6	16.4	26.7	1	2
Amarillo, TX MSA	2.06	35679	73600	0.16	119.5	0.21	29.6	17.7	27.7	3	7
Anchorage, AK MSA	2.74	55546	152300	0.15	153.4	0.2891	36.8	15.1	28.5	4	9
Anniston, AL MSA	2.07	31768	65700	-0.03	184.5	0.1522	25.5	14.6	25	3	6
Appleton--Oshkosh--Neenah, WI MSA	2.15	47438	102000	0.14	256.2	0.2243	29.8	12.8	25.5	2	3
Asheville, NC MSA	2.76	36179	99800	0.29	204.4	0.2448	31.7	15.4	25.2	3	5
Athens, GA MSA	3.06	33416	102400	-0.02	259.9	0.3408	35.7	15.4	25	3	5
Atlanta, GA MSA	2.55	51948	132600	0.45	671.5	0.3205	37.5	12.1	28.7	3	5
Auburn--Opelika, AL MSA	2.76	30952	85500	0.32	189.1	0.2791	33.9	15.2	25.8	3	6
Augusta--Aiken, GA--SC MSA	2.12	38103	80800	0.20	195	0.2092	32.4	15.5	24.2	3	5
Austin--San Marcos, TX MSA	2.48	48950	121300	0.60	295.9	0.3669	41.9	12.4	26.7	3	7
Bakersfield, CA MSA	2.52	35446	89400	0.22	81.3	0.1352	27	17.6	24.1	4	9
Bangor, ME MSA	2.43	35837	87200	0.02	228.7	0.2642	34.7	16.7	28.6	1	1
Barnstable--Yarmouth, MA MSA	3.82	46034	175700	0.20	625.8	0.3347	34.6	18.5	28	1	1
Baton Rouge, LA MSA	2.40	38438	92200	0.14	380.1	0.2494	33.2	14.3	28.6	3	7
Beaumont--Port Arthur, TX MSA	1.64	35669	58500	0.07	178.8	0.1471	27.5	16.4	26.2	3	7
Bellingham, WA MSA	3.74	40005	149500	0.31	78.7	0.2723	31.5	16.5	26.3	4	9
Benton Harbor, MI MSA	2.42	38567	93300	0.01	284.5	0.1962	29.3	15.3	24.1	2	3
Billings, MT MSA	2.65	36727	97200	0.14	49.1	0.2638	31	16.7	30.8	4	8
Biloxi--Gulfport--Pascagoula, MS MSA	2.17	36662	79500	0.85	203.9	0.1755	27.7	20.1	25.3	3	6
Binghamton, NY MSA	2.03	36374	73800	-0.05	205.9	0.2204	34.5	15.7	26.3	1	2
Birmingham, AL MSA	2.38	39278	93500	0.01	289.1	0.2471	34.4	12.7	29.8	3	6
Bismarck, ND MSA	2.14	40148	85800	0.13	26.6	0.2554	35	16.5	28.1	2	4
Bloomington, IN MSA	3.23	33311	107500	0.11	305.7	0.3963	39.4	17.1	25.4	2	3
Bloomington--Normal, IL MSA	2.32	47021	109300	0.16	127.1	0.3617	37.3	15.3	28.9	2	3
Boise City, ID MSA	2.69	42570	114600	1.10	262.9	0.2648	34.9	14.5	26.9	4	8
Boston--Worcester--Lawrence, MA--NH--ME--CT CMSA	3.57	52792	188600	0.39	1034.1	0.3439	42.1	13.3	26.1	1	1

Brownsville--Harlingen--San Benito, TX MSA	1.84	26155	48000	0.29	370.1	0.1336	27.7	19.8	24.9	3	7
Bryan--College Station, TX MSA	3.03	29104	88200	0.25	260.2	0.3699	39.3	16.4	25.3	3	7
Buffalo--Niagara Falls, NY MSA	2.26	38488	86900	-0.02	746.6	0.2321	33.6	15.7	27.9	1	2
Burlington, VT MSA	2.84	46732	132600	0.29	301.4	0.3718	41.5	13	26	1	1
Canton--Massillon, OH MSA	2.51	39457	99200	0.03	419.2	0.1732	28.1	14.6	26.2	2	3
Casper, WY MSA	2.22	36619	81400	0.09	12.5	0.2002	28.5	15.8	29.9	4	8
Cedar Rapids, IA MSA	2.10	46206	97200	0.14	267.2	0.2773	34.8	12.4	29.6	2	4
Champaign--Urbana, IL MSA	2.41	37780	91200	0.04	180.2	0.3799	42.2	14.9	25.3	2	3
Charleston, WV MSA	2.21	35418	78400	0.00	201.4	0.204	33.4	14.6	30.1	3	5
Charleston--North Charleston, SC MSA	2.45	39491	96700	0.08	211.9	0.2503	32.5	16.2	26.3	3	5
Charlotte--Gastonia--Rock Hill, NC--SC MSA	2.52	46119	116200	0.29	444	0.2647	33	12.1	27.4	3	5
Charlottesville, VA MSA	3.06	44356	135600	0.22	135.6	0.4008	45.4	14.3	23.7	3	5
Chattanooga, TN--GA MSA	2.31	37411	86500	0.07	255.1	0.1967	29.9	13.5	26.8	3	6
Cheyenne, WY MSA	2.56	39607	101200	0.12	30.4	0.2345	32.2	14.8	27.7	4	8
Chicago--Gary--Kenosha, IL--IN--WI MSA	3.04	51046	155100	0.14	1322	0.2889	35.5	13.1	28.4	2	3
Chico--Paradise, CA MSA	3.64	31924	116200	0.12	123.9	0.2184	31.7	18.7	26.7	4	9
Cincinnati--Hamilton, OH--KY--IN MSA	2.51	44914	112800	0.13	519.6	0.2502	33.9	13.9	28	2	3
Clarksville--Hopkinsville, TN--KY MSA	2.24	36313	81400	0.22	164.2	0.1698	26.6	16.6	25.3	3	6
Cleveland--Akron, OH CMSA	2.73	42215	115300	0.07	815.6	0.2354	32.8	14.5	27.7	2	3
Colorado Springs, CO MSA	3.07	46844	143600	0.30	243.1	0.3176	37.2	14.5	27.7	4	8
Columbia, MO MSA	2.69	37485	100800	0.21	197.6	0.4173	41.8	14.8	27	2	4
Columbia, SC MSA	2.26	41677	94000	0.18	368.7	0.292	37.3	14.1	28	3	5
Columbus, GA--AL MSA	2.36	34512	81400	0.13	174.9	0.1856	29.4	16	26.5	3	5
Columbus, OH MSA	2.65	44782	118700	0.12	490.3	0.2905	36.4	13.7	29.2	2	3
Corpus Christi, TX MSA	1.88	35773	67100	0.09	249.3	0.178	29.6	17.7	27.2	3	7
Corvallis, OR MSA	3.97	41997	166500	0.10	115.5	0.4739	46.9	14.8	20.7	4	9
Cumberland, MD--WV MSA	2.26	30916	69900	0.00	135.4	0.1344	25.7	18.7	25	3	5
Dallas--Fort Worth, TX CMSA	2.03	47418	96200	0.34	573.6	0.2837	36	12.4	28.9	3	7
Danville, VA MSA	2.32	31201	72500	0.01	108.7	0.1127	21.5	14.1	23.9	3	5
Davenport--Moline--Rock Island, IA--IL MSA	2.05	40621	83300	0.02	210.2	0.2026	29.4	16.1	27.3	2	4
Daytona Beach, FL MSA	2.39	35722	85300	0.33	310.5	0.1803	28.9	18.2	28.7	3	5
Dayton--Springfield, OH MSA	2.37	41550	98300	0.00	564.6	0.2215	32.8	14.6	26.3	2	3
Decatur, AL MSA	2.16	36299	78300	0.11	114.4	0.1581	25.1	13	22.9	3	6
Decatur, IL MSA	1.81	37859	68500	-0.02	197.6	0.1692	28.4	15.7	26.2	2	3
Denver--Boulder--Greeley, CO CMSA	3.38	51088	172800	0.40	303.9	0.3546	39.4	12.5	28	4	8
Des Moines, IA MSA	2.16	46651	100800	0.16	264	0.2872	35.6	13.6	30.6	2	4

Detroit--Ann Arbor--Flint, MI CMSA	2.60	49160	127900	0.17	831.1	0.237	33.8	14.1	26.2	2	3
Dothan, AL MSA	2.10	33455	70200	0.05	120.8	0.1689	27.7	15.7	26.5	3	6
Dover, DE MSA	2.52	40950	103300	0.14	214.8	0.1864	28.5	17	26.9	3	5
Dubuque, IA MSA	2.32	39582	91900	0.03	146.6	0.2133	29.7	15.7	26.5	2	4
Duluth--Superior, MN--WI MSA	2.05	36081	73900	0.02	32.4	0.2123	29.8	18.2	26.5	2	4
Eau Claire, WI MSA	2.36	39372	93100	0.08	90	0.2212	29.7	16	26.6	2	3
El Paso, TX MSA	2.16	31051	67100	0.15	670.8	0.1661	29.1	16.9	28.1	3	7
Elkhart--Goshen, IN MSA	2.15	44478	95600	0.17	394.1	0.1551	23.8	11	23.4	2	3
Elmira, NY MSA	1.82	36415	66200	-0.04	223.1	0.1858	32	19.2	25.2	1	2
Enid, OK MSA	1.79	33006	59100	0.02	54.6	0.1955	27.2	19.1	25.6	3	7
Erie, PA MSA	2.25	36627	82500	0.02	350.2	0.2087	29.2	16.3	25.6	1	2
Eugene--Springfield, OR MSA	3.68	36942	136000	0.14	70.9	0.2551	31.9	15.7	26.3	4	9
Evansville--Henderson, IN--KY MSA	2.14	39307	84000	0.06	201.9	0.1849	28.3	14.5	27.4	2	3
Fargo--Moorhead, ND--MN MSA	2.38	38069	90600	0.14	62	0.294	33	15.4	30	2	4
Fayetteville, NC MSA	2.27	37466	84900	0.10	464.2	0.1911	28.8	16.7	27	3	5
Fayetteville--Springdale--Rogers, AR MSA	2.43	37322	90700	1.74	173.3	0.2237	30.8	13.3	26.7	3	7
Flagstaff, AZ--UT MSA	3.22	37971	122300	0.20	5.4	0.2946	34.5	19.1	25.6	4	8
Florence, AL MSA	2.31	32704	75500	0.09	113.1	0.1678	25.4	13.9	25.9	3	6
Florence, SC MSA	2.05	35144	71900	0.10	157.2	0.1868	30.2	14.9	24.8	3	5
Fort Collins--Loveland, CO MSA	3.46	48555	168200	0.35	96.7	0.3953	39.6	13.9	24.8	4	8
Fort Myers--Cape Coral, FL MSA	2.40	40319	96700	0.32	548.6	0.211	28.1	18.5	29.7	3	5
Fort Pierce--Port St. Lucie, FL MSA	2.29	38724	88700	0.27	283.2	0.1974	28.3	18.1	28.2	3	5
Fort Smith, AR--OK MSA	2.07	32399	67100	0.18	114.8	0.1379	25	14.4	24.3	4	8
Fort Walton Beach, FL MSA	2.33	41474	96800	0.19	182.2	0.2424	32	19	26.9	3	5
Fort Wayne, IN MSA	2.04	42817	87400	0.38	205.2	0.1938	28.9	13	25.6	2	3
Fresno, CA MSA	3.00	34960	105000	0.38	113.9	0.1676	28.9	16.2	25.7	4	9
Gadsden, AL MSA	2.13	31170	66500	0.04	193.4	0.1342	25.3	13.7	25	3	6
Gainesville, FL MSA	2.81	31426	88400	0.07	249.3	0.387	44	16.2	26.3	3	5
Glens Falls, NY MSA	2.25	38526	86600	0.05	72.9	0.189	28.8	17.4	25.9	1	2
Goldboro, NC MSA	2.27	33942	77000	0.08	205.1	0.1499	28.1	15.1	24.3	3	5
Grand Forks, ND--MN MSA	2.32	35562	82600	0.38	28.6	0.2424	31.6	19.2	25	2	4
Grand Junction, CO MSA	3.17	35864	113800	0.25	34.9	0.2195	29.3	17.2	27.9	4	8
Grand Rapids--Muskegon--Holland, MI MSA	2.41	46116	111000	0.58	394.6	0.2291	29.6	13.5	25.6	2	3
Great Falls, MT MSA	2.72	32971	89600	0.03	29.8	0.2148	30.5	18.4	29.7	4	8
Green Bay, WI MSA	2.50	46447	116100	0.17	429	0.2247	30.6	12.6	28.5	2	3
Greensboro--Winston-Salem--High Point, NC MSA	2.43	40913	99600	0.33	322.5	0.2288	30.6	12.4	26.2	3	5
Greenville, NC MSA	2.49	32868	82000	0.24	205.3	0.264	33.7	15.5	26.1	3	5

Greenville--Spartanburg--Anderson, SC MSA	2.31	38458	88700	0.50	300	0.2073	29	13.2	25	3	5
Harrisburg--Lebanon--Carlisle, PA MSA	2.43	43022	104700	0.07	316.2	0.2261	32.2	14.1	28.1	1	2
Hartford, CT MSA	2.76	52188	143800	0.09	705.4	0.2979	39.1	13.9	27	1	1
Hattiesburg, MS MSA	2.36	30981	73200	0.13	115.9	0.243	31.1	16.3	28.1	3	6
Hickory--Morganton--Lenoir, NC MSA	2.26	37818	85600	0.54	208.6	0.1362	22.2	11.8	21.9	3	5
Honolulu, HI MSA	5.29	51914	274600	0.05	1460.8	0.2787	33.8	19.6	29.1	4	9
Houma, LA MSA	2.04	35089	71700	0.06	83.1	0.123	25.2	13.8	26.1	3	7
Houston--Galveston--Brazoria, TX CMSA	1.91	44761	85600	0.26	606	0.2651	35.2	13.6	27.3	3	7
Huntington--Ashland, WV--KY--OH MSA	2.21	29415	65100	0.01	146.1	0.1438	27.2	16.6	28.2	3	5
Huntsville, AL MSA	2.20	43104	95000	0.43	249.4	0.309	40.4	12.4	23.5	3	6
Indianapolis, IN MSA	2.40	45548	109200	0.29	456.3	0.2583	33.7	13.5	27.9	2	3
Iowa City, IA MSA	3.09	40060	123700	0.15	180.7	0.476	43.3	15.5	26.1	2	4
Jackson, MI MSA	2.23	43171	96300	0.06	224.2	0.1626	27.5	16.5	24.6	2	3
Jackson, MS MSA	2.12	38887	82400	0.11	186.7	0.281	35.1	14.2	29.1	3	6
Jackson, TN MSA	2.22	36649	81200	0.38	127	0.2007	29.8	13.9	26.1	3	6
Jacksonville, FL MSA	2.18	42439	92500	0.21	417.6	0.2287	32	14.4	31.4	3	5
Jacksonville, NC MSA	2.32	33756	78200	0.00	196.1	0.1477	26.1	19.2	28	3	5
Jamestown, NY MSA	1.87	33458	62700	-0.02	131.6	0.1694	27.2	18.2	23.4	1	2
Janesville--Beloit, WI MSA	2.16	45517	98300	0.09	211.4	0.1668	25.4	14	23.7	2	3
Johnson City--Kingsport--Bristol, TN--VA MSA	2.53	31596	79800	0.10	167.5	0.166	27.2	14	26	3	6
Johnstown, PA MSA	2.08	30442	63400	-0.04	132	0.1271	26.8	17.9	24.4	1	2
Jonesboro, AR MSA	2.31	32425	74800	0.19	115.6	0.2094	28.5	14.4	26	3	7
Joplin, MO MSA	2.14	32446	69300	0.17	124.3	0.1637	25.9	14.4	25.3	2	4
Kalamazoo--Battle Creek, MI MSA	2.32	40710	94600	1.03	240.7	0.2346	31	15.7	24.8	2	3
Kansas City, MO--KS MSA	2.26	46193	104400	0.13	328.5	0.285	35.8	13.5	28.9	2	4
Killeen--Temple, TX MSA	2.03	36669	74500	0.23	148.2	0.1807	30.1	17.9	27	3	7
Knoxville, TN MSA	2.55	36874	94000	0.14	280.6	0.2347	32.5	15	27.9	3	6
Kokomo, IN MSA	1.95	44531	87000	0.05	183.5	0.1714	25.9	15.7	20.6	2	3
La Crosse, WI--MN MSA	2.37	39692	94100	0.30	125.4	0.2457	31.2	16.4	26.7	2	3
Lafayette, IN MSA	2.63	39072	102900	0.40	202	0.2823	33.6	15.4	23	2	3
Lafayette, LA MSA	2.31	30998	71700	0.85	148.7	0.1755	29.9	15.6	26.8	3	7
Lake Charles, LA MSA	1.99	35372	70300	0.09	171.4	0.1686	27.2	18.2	25.6	3	7
Lakeland--Winter Haven, FL MSA	1.94	36036	69800	0.19	258.2	0.1492	26.2	16.7	27.1	3	5
Lancaster, PA MSA	2.60	45507	118300	0.11	495.9	0.2051	28.1	13.9	24.9	1	2
Lansing--East Lansing, MI MSA	2.39	44441	106200	0.03	262.3	0.2838	34.6	15.3	27.2	2	3
Laredo, TX MSA	2.38	28100	67000	0.45	57.5	0.1393	26.7	17.8	29	3	7

Las Cruces, NM MSA	2.48	29808	74000	0.29	45.9	0.2229	32.3	18.3	25.1	4	4	8
Las Vegas, NV--AZ MSA	2.96	42468	125700	1.11	39.7	0.1639	24	26.7	27.8	4	4	8
Lawrence, KS MSA	3.08	37547	115600	0.22	218.8	0.4268	40.4	16.6	25	2	2	4
Lawton, OK MSA	2.08	33867	70500	0.03	107.5	0.1911	29.5	19.5	25.6	3	3	7
Lewiston--Auburn, ME MSA	2.45	35244	86500	0.03	298.2	0.1435	26.1	14.6	29.3	1	1	1
Lexington, KY MSA	2.60	39357	102500	0.38	249.7	0.2868	35.5	14.8	25.7	3	3	6
Lima, OH MSA	2.15	39284	84500	0.00	192.5	0.1344	25.4	16	22.5	2	2	3
Lincoln, NE MSA	2.51	41850	105100	0.17	298.4	0.3257	36	15	26.8	2	2	4
Little Rock--North Little Rock, AR MSA	2.10	39145	82100	0.14	200.8	0.2477	33.7	13.6	29.2	3	3	7
Longview--Marshall, TX MSA	1.91	34253	65300	0.29	118.6	0.1682	27.4	14.3	26.6	3	3	7
Los Angeles--Riverside--Orange County, CA CMSA	4.21	45903	193400	0.13	482.2	0.2439	34	14.7	27.7	4	4	9
Louisville, KY--IN MSA	2.44	40821	99800	0.08	495	0.2217	31.2	13.9	27.9	3	3	6
Lubbock, TX MSA	2.04	32198	65700	0.09	269.7	0.2437	33.2	16.7	29.3	3	3	7
Lynchburg, VA MSA	2.52	37010	93400	0.51	120	0.1926	28.8	13.9	26.8	3	3	5
Macon, GA MSA	2.11	38565	81400	0.15	210.6	0.1948	31	15.5	27.3	3	3	5
Madison, WI MSA	2.98	49223	146600	0.16	354.9	0.4064	43.6	12.7	26.5	2	2	3
Mansfield, OH MSA	2.30	37060	85200	0.39	195.6	0.1182	23.3	15.2	23.7	2	2	3
McAllen--Edinburg--Mission, TX MSA	1.85	24863	46000	0.48	362.8	0.1291	26.3	18.5	25.4	3	3	7
Medford--Ashland, OR MSA	3.62	36461	132100	0.24	65.1	0.2228	30.6	17.4	26.6	4	4	9
Metairie--Bossier--Shreveport, LA MSA	2.18	40099	87600	0.19	467.7	0.2355	34.9	16.5	26.9	3	3	5
Memphis, TN--AR--MS MSA	2.26	40201	90900	0.16	377.7	0.2269	31.7	14.1	29.7	3	3	6
Merced, CA MSA	3.12	35532	110900	0.18	109.2	0.1105	25.6	15.8	22	4	4	9
Miami--Fort Lauderdale, FL CMSA	2.81	38632	108400	0.21	1230	0.2291	31.6	16.7	31	3	3	5
Milwaukee--Racine, WI CMSA	2.78	46132	128200	0.05	942.3	0.262	34.6	13.4	27.1	2	2	3
Minneapolis--St. Paul, MN--WI MSA	2.56	54304	139200	0.20	489.7	0.3326	38.9	12.4	28	2	2	4
Missoula, MT MSA	3.74	34454	128700	0.22	36.9	0.328	32.3	17.9	28.3	4	4	8
Mobile, AL MSA	2.33	35629	83000	0.13	190.9	0.1987	29.2	15	27.1	3	3	6
Modesto, CA MSA	3.09	40101	123900	0.21	299.2	0.1405	26.5	15.4	25.6	4	4	9
Monroe, LA MSA	2.31	32047	74000	0.04	241.2	0.2273	30.8	16.6	29.6	3	3	7
Montgomery, AL MSA	2.27	37619	85300	0.14	165.9	0.2472	33.8	14.8	28.7	3	3	6
Muncie, IN MSA	2.15	34659	74400	-0.01	302	0.2038	30.1	17.5	26.4	2	2	3
Myrtle Beach, SC MSA	2.62	36470	95400	0.36	173.4	0.1872	26.2	20.1	29.8	3	3	5
Naples, FL MSA	3.09	48289	149000	0.65	124.1	0.2792	28.4	19.9	27.9	3	3	5
Nashville, TN MSA	2.73	44223	120800	0.25	302.3	0.2685	34.7	12.7	28.3	3	3	7
New London--Norwich, CT--RI MSA	2.81	49283	138500	0.01	443.3	0.2513	34.1	20	24.7	1	1	1
New Orleans, LA MSA	2.71	35317	95800	0.08	393.5	0.2256	32.9	17.3	28	3	3	7
New York--Northern New Jersey--Long Island, NY--NJ--CT--PA CMSA	3.93	50795	199800	0.17	2028.7	0.305	38.6	15.2	27.9	1	1	2

Norfolk--Virginia Beach--Newport News, VA--NC MSA	2.52	42448	107100	0.12	668.3	0.238	33.6	15.6	27.8	3	5
Ocala, FL MSA	2.19	31944	70100	0.33	164	0.1369	26.4	17.5	28.2	3	5
Odessa--Midland, TX MSA	1.54	34773	53500	0.99	131.6	0.1838	29.4	15.8	28.6	3	7
Oklahoma City, OK MSA	2.09	36797	76900	0.13	255.1	0.2445	32.4	15.1	28.8	3	7
Omaha, NE--IA MSA	2.23	44981	100100	0.16	289.6	0.2796	35	13.7	30.1	2	4
Orlando, FL MSA	2.38	41871	99500	0.53	471.1	0.248	32.6	17.3	29.8	3	5
Owensboro, KY MSA	2.19	36813	80600	0.05	198	0.1702	28.1	15.4	23.6	3	6
Panama City, FL MSA	2.32	36092	83700	0.17	194.1	0.1768	28.5	19.7	28.1	3	5
Parkersburg--Martietta, WV--OH MSA	2.23	33696	75200	0.01	150.9	0.1516	28.2	14.8	27.9	3	5
Pensacola, FL MSA	2.33	36975	86100	0.20	245.4	0.2153	30.7	17	28	3	5
Peoria--Pekin, IL MSA	2.07	42986	88900	0.02	193.4	0.2114	32.8	15.5	27	2	3
Philadelphia--Wilmington--Atlantic City, PA--NJ--DE--MD CMSA	2.53	47528	120300	0.05	1042.7	0.2688	36.9	14.8	28.6	1	2
Phoenix--Mesa, AZ MSA	2.67	44752	119600	0.53	223.1	0.2508	33.4	14.9	29.5	4	8
Pine Bluff, AR MSA	1.72	31327	53800	-0.01	95.2	0.1568	27.2	15.6	25.3	3	7
Pittsburgh, PA MSA	2.25	37467	84300	0.05	509.9	0.2384	33.9	15.9	27.7	1	2
Pittsfield, MA MSA	2.84	38515	109500	0.07	336.4	0.2406	34.5	18.3	26.8	1	1
Pocatello, ID MSA	2.37	36983	87000	0.14	67.9	0.2495	32.3	16.3	27.8	4	8
Portland, ME MSA	2.87	44707	128500	0.13	388.9	0.3356	38.3	13.9	28.8	1	1
Portland--Salem, OR--WA CMSA	3.52	46090	162200	0.53	325.8	0.2765	34.5	14	27.1	4	9
Providence--Fall River--Warwick, RI--MA MSA	3.18	41748	132700	0.04	1041.5	0.2362	33	15.3	27.1	1	1
Provo--Orem, UT MSA	3.35	45833	153600	0.40	184.4	0.3146	36.5	14	27.7	4	8
Pueblo, CO MSA	2.84	32775	93100	0.15	59.2	0.1834	28.2	18.2	28.2	4	8
Punta Gorda, FL MSA	2.41	36379	87700	0.28	204.2	0.1758	27.2	20.9	29.6	3	5
Raleigh--Durham--Chapel Hill, NC MSA	2.84	48845	138500	0.62	340.5	0.3891	44.3	11.8	24.8	3	5
Rapid City, SD MSA	2.24	37485	83800	0.09	31.9	0.2498	31.8	16.8	28.6	2	4
Reading, PA MSA	2.33	44714	104400	0.11	435	0.1849	29.3	13.3	26.1	1	2
Redding, CA MSA	3.29	34335	112900	0.11	43.1	0.166	30.4	19.6	27	4	9
Reno, NV MSA	3.26	45815	149500	0.33	53.5	0.2372	29.5	19.9	28.9	4	8
Richland--Kennewick--Pasco, WA MSA	2.40	44886	107600	0.28	65.1	0.2332	34.9	14.5	23.1	4	9
Richmond--Petersburg, VA MSA	2.46	46800	115000	0.15	338.4	0.2921	37	13.2	28.8	3	5
Roanoke, VA MSA	2.58	39288	101200	0.05	277.2	0.2246	31.9	13.8	30.3	3	5
Rochester, MN MSA	2.24	51316	114700	0.17	190.3	0.3471	44.5	14.1	23.4	2	4
Rochester, NY MSA	2.12	43955	93300	0.10	320.6	0.271	37.1	14.5	25.4	1	2
Rockford, IL MSA	2.13	44988	95600	0.31	238.9	0.1852	29	12.9	25.9	2	3
Rocky Mount, NC MSA	2.19	34795	76200	0.07	136.8	0.1388	25.6	13.6	25.4	3	5
Sacramento--Yolo, CA CMSA	3.39	46106	156200	0.21	352.7	0.2655	37.3	14.7	28.6	4	9
Saginaw--Bay City--Midland, MI MSA	2.17	39909	86700	0.01	227.2	0.1813	29.4	17.2	26.3	2	3
Salinas, CA MSA	5.27	48305	254800	0.13	120.9	0.225	29.2	16.8	23.2	4	9

Salt Lake City--Ogden, UT MSA	3.05	48594	148300	0.24	824.7	0.2653	32.7	13	30.8	4	8
San Angelo, TX MSA	1.89	33148	62700	0.06	68.3	0.195	27.9	18.9	28.5	3	7
San Antonio, TX MSA	1.89	39140	74100	0.22	478.7	0.2245	32.7	15.7	29.5	3	7
San Diego, CA MSA	4.50	47067	212000	0.13	670	0.2952	37.7	16.1	27.2	4	9
San Francisco--Oakland--San Jose, CA CMSA	5.49	62024	340800	0.13	955.4	0.3725	43.6	12.9	25.6	4	9
San Luis Obispo--Atascadero--Paso Robles, CA MSA	5.15	42428	218600	0.14	74.7	0.267	34.3	18.8	25.3	4	9
Santa Barbara--Santa Maria--Lompoc, CA MSA	5.66	46677	264100	0.08	145.9	0.2942	35.4	17.1	25.3	4	9
Santa Fe, NM MSA	3.82	45822	174900	0.26	73.1	0.3992	45.2	15.5	24.1	4	8
Sarasota--Bradenton, FL MSA	2.58	40649	104700	1.12	449.5	0.2458	30.5	18.1	29	3	5
Savannah, GA MSA	2.30	39622	91100	0.21	215.6	0.2316	31.2	16.1	26.8	3	5
Scranton--Wilkes-Barre--Hazleton, PA MSA	2.54	34161	86700	-0.15	279.9	0.1737	27.9	15.4	27.9	1	2
Seattle--Tacoma--Bremerton, WA CMSA	3.67	50733	186100	0.39	492	0.3198	38.4	14	26.4	4	9
Sharon, PA MSA	2.17	34666	75100	-0.01	179.1	0.1729	27.6	17.3	25.3	1	2
Sheboygan, WI MSA	2.29	46237	105800	0.08	219.3	0.1791	25.9	13.6	21.6	2	3
Sherman--Denison, TX MSA	1.82	37178	67800	0.16	118.5	0.1724	29.6	14.4	26.5	3	7
Shreveport--Bossier City, LA MSA	2.15	32558	70100	0.17	169.4	0.1907	28.6	18.5	26.7	3	7
Sioux City, IA--NE MSA	1.96	38563	75600	0.08	109.2	0.1788	27	15.4	27.1	2	4
Sioux Falls, SD MSA	2.27	43387	98600	0.39	124.2	0.2591	31.1	12.9	32.2	2	4
South Bend, IN MSA	2.12	40420	85800	0.07	580.7	0.2363	32.1	14.5	27.2	2	3
Spokane, WA MSA	2.98	37308	111200	0.16	237	0.2502	33	16.9	28.4	4	9
Springfield, IL MSA	2.04	43180	87900	0.06	170.4	0.2805	39	14.6	29.7	2	3
Springfield, MA MSA	2.96	40740	120400	0.12	804.7	0.2241	34.4	16.5	26.1	1	1
Springfield, MO MSA	2.57	34661	89000	0.35	177.8	0.2241	29.4	15.5	29.1	2	4
St. Cloud, MN MSA	2.40	42321	101500	-0.12	95.5	0.2096	29.3	14.4	26.8	2	4
St. Joseph, MO MSA	2.11	35675	75100	0.23	121.3	0.1718	27.8	16.9	26.3	2	4
St. Louis, MO--IL MSA	2.16	44437	96200	0.07	407.3	0.2533	34.4	14.8	28.1	2	4
State College, PA MSA	3.03	36165	109400	0.10	122.6	0.3628	41.6	16.5	23.5	1	2
Steubenville--Weirton, OH--WV MSA	2.01	31982	64400	-0.07	227.1	0.1207	22.5	17.6	26.6	2	3
Stockton--Lodi, CA MSA	3.39	41282	139800	0.17	402.8	0.1453	27.1	14.6	27.1	4	9
Sumter, SC MSA	2.01	33278	67000	0.02	157.3	0.1582	24.9	15.5	24.5	3	5
Syracuse, NY MSA	2.03	39750	80600	0.11	237.5	0.2408	33.9	15.3	27	1	2
Tallahassee, FL MSA	2.57	36441	93600	0.22	240.5	0.3673	42.8	15.1	28.3	3	5
Tampa--St. Petersburg--Clearwater, FL MSA	2.27	37406	84800	0.16	938.1	0.2169	32.8	15.2	31.1	3	5
Terre Haute, IN MSA	2.05	34222	70200	0.14	146.6	0.1861	27.5	17.4	26.2	2	3
Texarkana, TX--Texarkana, AR MSA	1.90	32238	61100	0.08	85.8	0.1503	27.2	16.3	26.9	3	7

Toledo, OH MSA	2.35	39902	93600	0.01	453	0.2161	30.2	15.4	25.7	2	3
Topeka, KS MSA	1.94	40988	79600	0.06	309	0.2604	34.2	14.4	29.8	2	4
Tucson, AZ MSA	2.79	36758	102600	0.27	91.8	0.2675	35	17.6	27.1	4	8
Tulsa, OK MSA	2.14	38261	81900	0.13	160.2	0.2322	32.2	13.7	28.9	3	7
Tuscaloosa, AL MSA	2.77	34936	95400	0.10	124.5	0.2403	32	14.1	27.1	3	6
Tyler, TX MSA	2.06	37148	76500	0.15	188.2	0.2255	30.3	15.3	27.1	3	7
Utica--Rome, NY MSA	2.01	35292	71100	-0.05	114.3	0.1774	31	18	26.7	1	2
Victoria, TX MSA	1.77	38732	68600	0.13	95.3	0.1625	28.5	15.1	27.4	3	7
Visalia--Tulare--Porterville, CA MSA	2.84	33983	96500	0.18	76.3	0.115	25.3	16.2	22.7	4	9
Waco, TX MSA	1.98	33560	66400	0.13	204.9	0.191	30	16	27.6	3	7
Washington--Baltimore, DC--MD--VA--WV CMSA	2.75	57291	157400	0.94	794.5	0.371	45.4	13.4	25.3	3	5
Waterloo--Cedar Falls, IA MSA	2.04	37266	76200	-0.13	225.7	0.2298	30.3	16	27.5	2	4
Wausau, WI MSA	2.13	45165	96200	0.09	81.4	0.183	29.7	12.2	26.2	2	3
West Palm Beach--Boca Raton, FL MSA	2.55	45062	115000	0.31	573	0.2771	34.4	17.7	29	3	5
Wheeling, WV--OH MSA	2.12	30335	64400	-0.04	161.1	0.1464	27.1	18.3	26.2	2	3
Wichita Falls, TX MSA	1.75	34098	59800	0.15	91.4	0.197	29	18.4	26.1	3	7
Wichita, KS MSA	1.89	42651	80400	0.12	183.8	0.2471	32	13.7	26.5	2	4
Williamsport, PA MSA	2.49	34016	84700	0.01	97.2	0.1506	24.4	15.8	26.7	1	2
Wilmington, NC MSA	3.05	38632	118000	0.94	221.5	0.2607	31.3	16.9	26.5	3	5
Yakima, WA MSA	3.08	34828	107200	0.18	51.8	0.153	27.4	16.1	22.5	4	9
York, PA MSA	2.39	45268	108200	-0.09	422.1	0.1838	28.4	12.5	26.2	1	2
Youngstown--Warren, OH MSA	2.25	36255	81500	0.21	380.2	0.1508	24.9	15.7	25.7	2	3
Yuba City, CA MSA	3.12	34658	108100	0.13	112.8	0.1322	26.3	16.3	24.5	4	9
Yuma, AZ MSA	2.24	32182	72100	0.50	29	0.1184	26.7	17.7	26.4	4	8